Agilent 7890 GC Control Driver User Guide

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Introduction

This document describes the configuration of the Agilent 7890 Gas Chromatograph driver. It also explains how to build a control method for this driver, how to start and view a running acquisition and which actions are available during an analysis.

Installation and Configuration

Installing the Driver Software

To install the CompassCDS Drivers software, refer to the CompassCDS installation Guide.

Configuring the GC Communications

Ethernet Communications

The Agilent 7890 Gas Chromatograph uses Ethernet® as the method of communications for instrument control and for sending digital data to the external data system.

Ethernet communication is standard on the Agilent 7890 GC.

The Ethernet connection is made at the back at the 7890 GC. There are two types of Ethernet cables:

- An Ethernet crossover cable is used when the Agilent 7890 GC is connected directly to the CompassCDS Acquisition Server PC.
- A standard Ethernet patch cable is used when the Agilent 7890 GC is connected to a company Ethernet network.

The Agilent 7890 GC uses TCP/IP (Transmission Control Protocol / Internet Protocol) to communicate over the Ethernet network and needs to be given a unique IP address to identify the instrument.

A BOOTP Server or a DHCP server is used to send IP addresses to TCP/IP devices.

The BOOTP Server lists Ethernet addresses along with the IP addresses that are to be assigned to the corresponding devices.

To know how to configure the BOOTP server, refer to the CompassCDS Installation Guide.

It is also possible to give a fixed IP address to the GC. To know how to fix the IP address of the GC, refer to the 7890 GC manual.

NOTE: The BOOTP server provided by CompassCDS is installed during the installation of the CompassCDS software.

Configuring the Driver

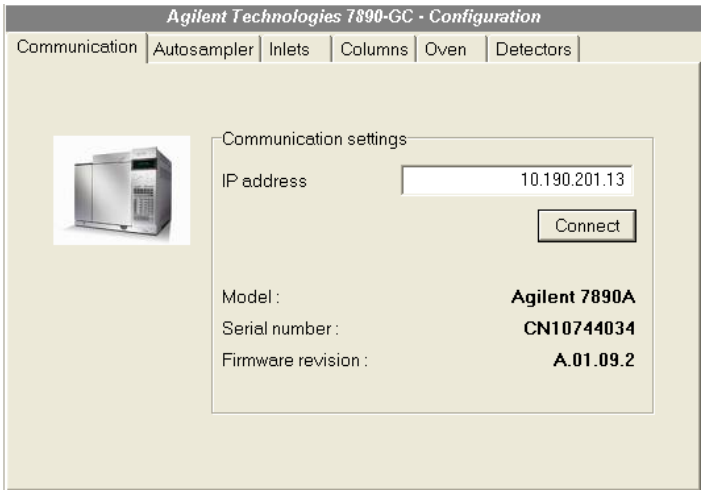
The driver software configuration is done in the CompassCDS Configuration Manager when a new chromatographic system is created.

Configuring the Agilent 7890 Gas Chromatograph

Click on the

button corresponding to the Agilent 7890 Gas Chromatograph driver and the configuration screen appears.

Communication Window



Communication settings Parameter Group

IP address:

Type the IP address of the instrument. Once the IP has been correctly typed, press the Connect button to activate the communication with the GC.

Model:

In this field, the model of the 7890 GC is automatically updated when the communication is established.

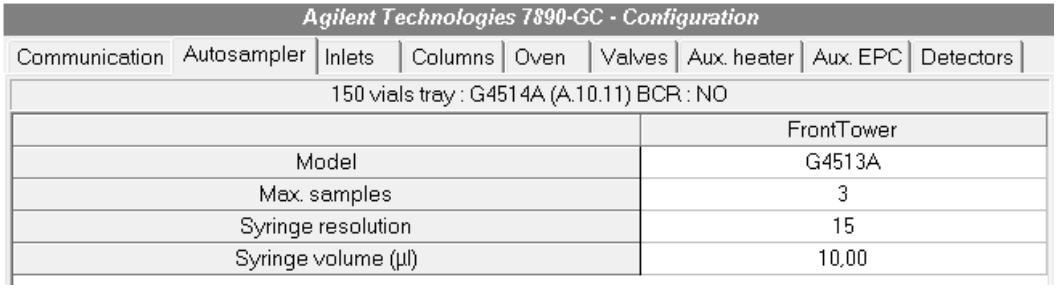
Serial number:

In this field, the serial number of the 7890 GC is automatically updated when the communication is established.

Firmware revision:

In this field, the firmware revision of the 7890 GC is automatically updated when the communication is established.

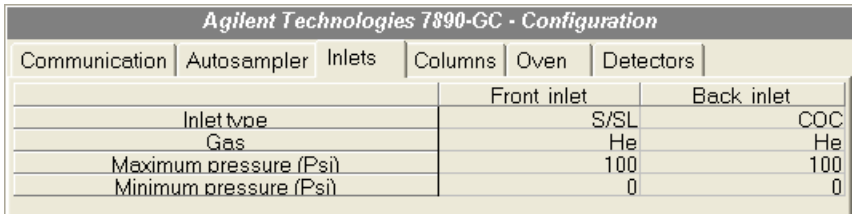
Autosampler Window



The autosampler(s) present on the GC is (are) automatically detected and their parameters are uploaded as follows:

- The sampler model
- The tray model if a tray is configured
- The maximum sample number, depending on the sampler turret model.

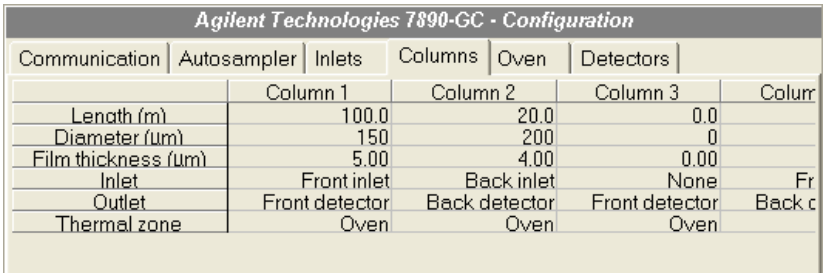
Inlets Window



The inlets present in the GC are automatically detected and their parameters are uploaded. For an S/SL inlet, the gas, the Minimum and the Maximum pressure are uploaded from the GC. For a COC inlet, the gas, the Minimum and the Maximum pressure are uploaded from the GC.

For a MMI inlet, the gas, the Minimum and the Maximum pressure, and the presence of the Cryo and its type are uploaded from the GC.

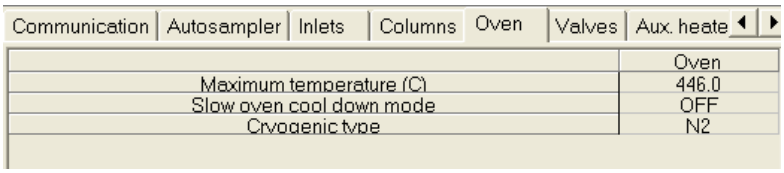
Columns Window



The columns defined on the GC are automatically detected and their parameters are uploaded.

For each column, the length (in meters), the diameter (in micrometers), the film thickness (in micrometers), the associated inlet, the outlet and the thermal zone are uploaded from the GC.

Oven Window

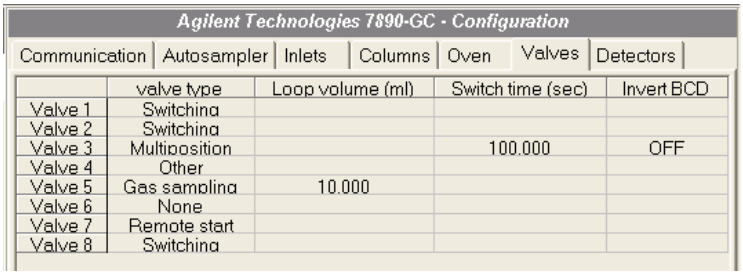


The maximum oven temperature is automatically displayed.

The slow oven cool down mode setting (ON or OFF) is displayed as well. Cryogenic Type is displayed if cryo is installed, with the selected gas.

All these fields are read-only and can only be edited from the GC front panel.

Valves Options Window

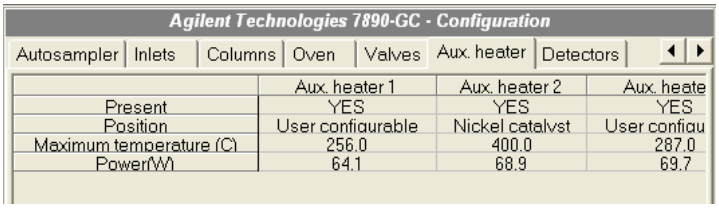


The user can configure up to 8 valves.

Select the Valve Type. Six choices are available: None, Multiposition, Gas sampling, Remote Start, Switching and Other.

- Multiposition: Generally used as a gas stream selection valve, to select one of several gas streams.
- Gas sampling: A run is automatically started when the valve switches from load position to inject position.
- Other: Could be anything.
- Remote Start: to send a start to the GC.
- Switching: Generally used to select one of two columns for analysis.

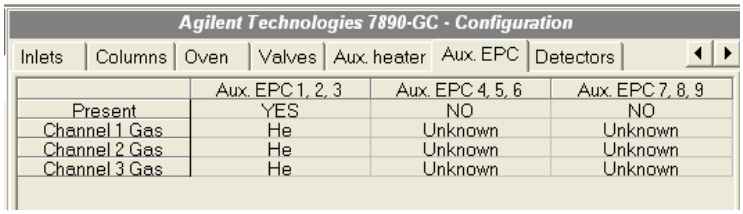
Auxiliary Options Window



The auxiliary thermal controller provides two channels of temperature control. Configure the Auxiliary on the GC.

According to the Aux heater selected on the GC, the maximum temperature can be defined by the user or not. The maximum temperature and the power (calculated by the GC) are listed in the configuration screen, by auxiliary heater.

Auxiliary EPC Options Window



The Auxiliary Pressure Controller (Aux EPC) option. It has three independent forward-pressure regulated channels. Each channel is assigned a number from 1 to 9 (there can be up to 3 Aux EPCs, containing each 3 channels), depending on where the module is installed.

Pressure Control Module Options Window

Communication | Autosampler | Inlets | PCM | Columns | Oven | Valves

	PCM A	PCM B	PCM C
Present	NO	NO	YES
Heater	NO	NO	NO
Channel1 Gas	Unknown	Unknown	N2
Channel2 Gas	Unknown	Unknown	H2
Channel2 Mode	Unknown mode	Unknown mode	Forward pressure

Three Pressure Control Modules (PCM) can be installed (A, B and C). For each one configure on the GC whether a heater is available or not, the gas for channel 1 (PCM on GC) and channel 2 (Aux PCM on GC), for channel2 configure whether it is in forward pressure or Back pressure mode.

Detectors Window

Agilent Technologies 7890-GC - Configuration

Communication | Autosampler | Inlets | PCM | Columns | Oven | Valves | Aux. heater | Aux. EPC | Detectors

	Front detector	Back detector	Aux detector 1 detector	Aux detector 2 detector
Detector type	FID	TCD	TCD	AIB
Fuel gas	H2			
Utility / Reference gas	Air	He	He	
Makeup gas	He	He	He	
Lit offset	2.0			
Auto adjust				
Dry bead				
Blos bead				
Max. bead voltage (V)				

The detectors present in the GC are automatically detected and their parameters are uploaded. For a FID, the 3 gas types (Fuel, Utility and Makeup) and the Lit Offset are uploaded from the GC. For a TCD, the 2 gas types (Utility/reference gas and Makeup) are uploaded from the GC.

For a NPD, the 3 gas types (Fuel, Utility and Makeup), Auto Adjust Bead, Dry bead, Blos Bead, Max Bead Voltage are uploaded from the GC.

For a FPD, the 3 gas types (Fuel, Utility and Makeup) and Lit offset are uploaded from the GC. Auxiliary detectors are also listed in this window. 2 Aux detectors can be configured: TCD and AIB.

Auxiliary detectors are also listed in this window. 2 Aux detectors can be configured: TCD and AIB.

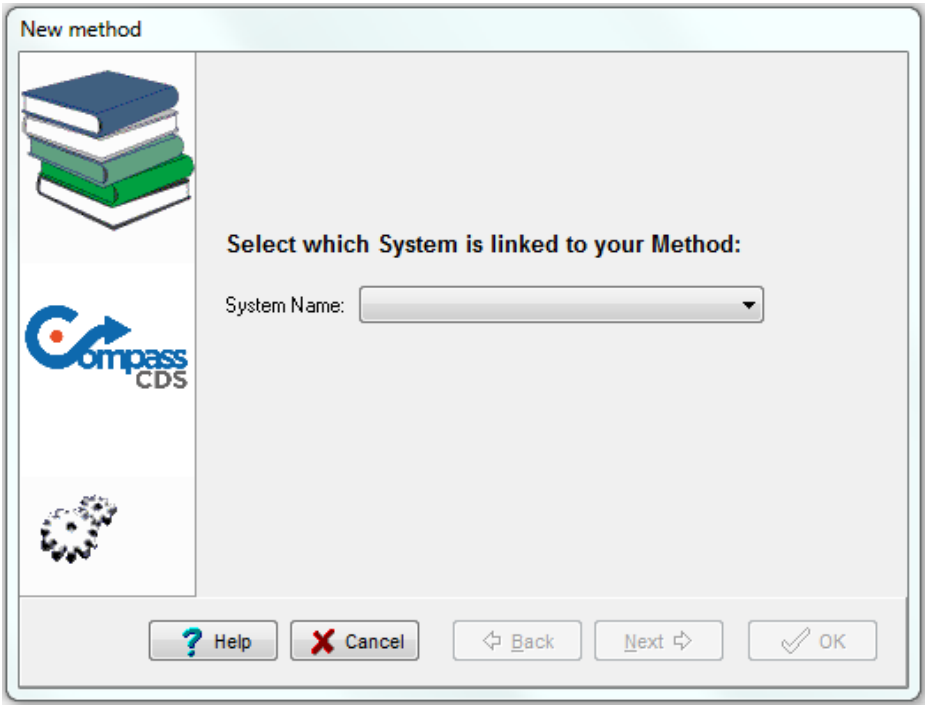
Building a Method

Creating a New Method

The method contains parameters for instrument control, data acquisition, chromatogram processing, and editing of final results. To initially set up a method, it is not necessary to define all of the sub-method sections; however, you must fill in the instrument control section prior to starting an acquisition.

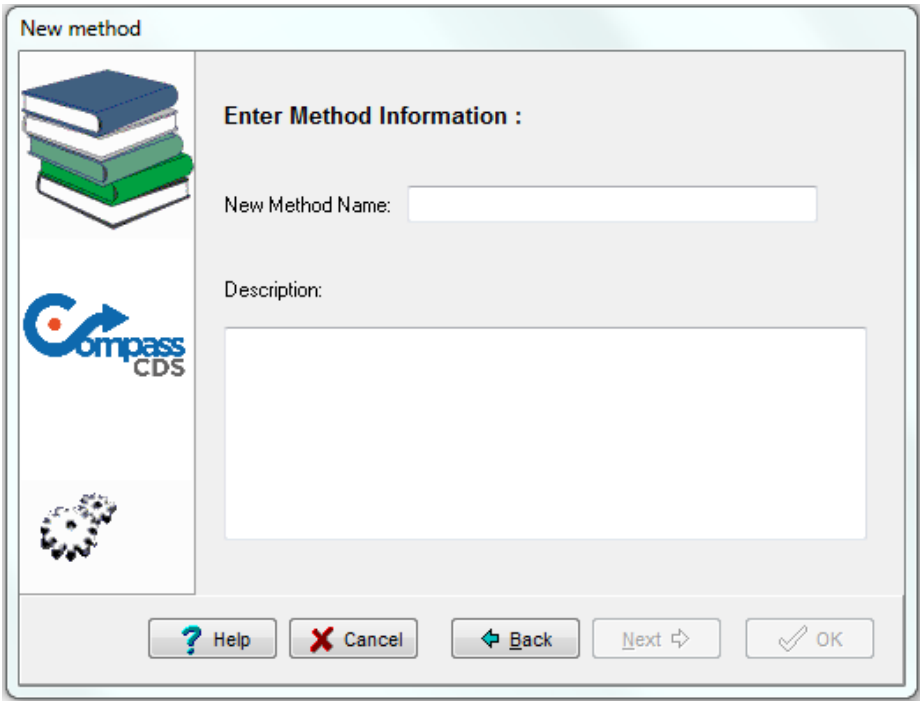
To create a new method, select the ***FILE / NEW METHOD*** option from the CompassCDS Chromatography Data System main menu.

A wizard guide will appear and provide assistance during the first steps of method creation:



Choose the system (chromatograph) associated with the method. A method is created for a particular system. When starting an acquisition, the name of the system that performs the acquisition must be correct, since method access is limited only to those methods associated with this system.

Once this field is completed, click on the Next button to move to the second step of the method creation:



Enter the New Method Name in the first field. In the Description field, enter information concerning the method (optional).

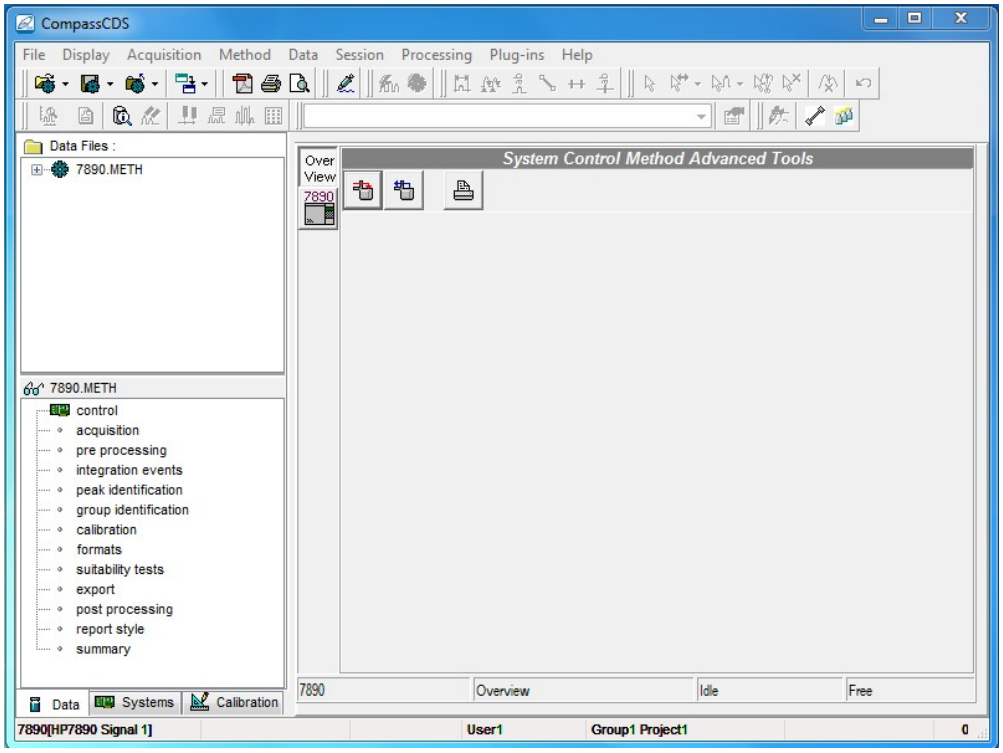
Once these two fields have been completed, click on the OK button. The new method is created and is opened with default parameters in the CompassCDS Chromatography Data System. The next step is the definition of each of the method sections.

The control section must be defined in order to start an acquisition. In the following part of this guide, only the instrument control section for the Agilent 7890 Gas Chromatograph is detailed. Other parameters such as Injection Volume, Vial and Rack number may be necessary and are defined in the acquisition section.

NOTE: For more details about the programming of each method section, turn to the CompassCDS Chromatography Data System User Guide.

Control Method Section for the Agilent 7890 Gas Chromatograph

Once the new method is created, select the control section in the lower part of the browser. The following screen appears:



Press the Over View button to display the ***System Control Method Advanced Tools*** window:

to send the current method to the instrument

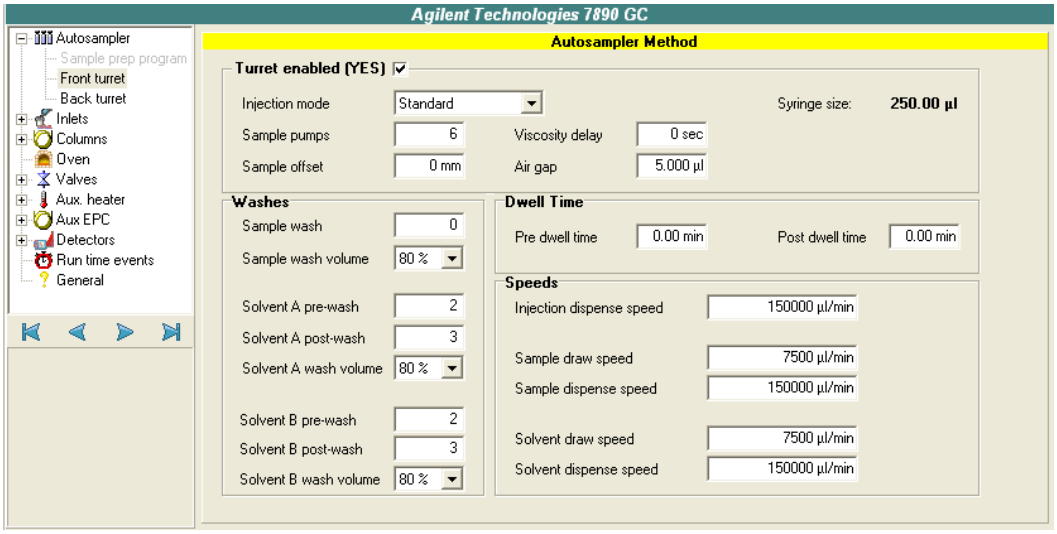
to get the active method from the instrument

to print the current method

Click on the button to display the Agilent 7890 Gas Chromatograph control method section.

It contains 10 sub-sections: *Autosampler, Inlets, Columns, Oven, Valves, Aux .heater, Aux EPC, Detectors, Run time events and General*. Click on the required sub-section to define the corresponding parameters that will be used during the chromatographic run.

Autosampler Control



Front / Back turret

Depending on the system configuration, select the *Front* or *Back turret* section to set the sampler information of each sub-system.

Injection:

Select the *Enabled* box to activate and consider the *Sampler parameters*.

Select the *Injection mode*: Standard, 2-layer sandwich or 3-layer Sandwich mode in order to use the sandwich injection, Large Volume (LVI).

In the *Sample Pumps* field, enter the number of pumps before the injection (plunger strokes to avoid the formation of bubbles and improve reproducibility).

In the *Sample offset* field, set the variable sampling depth. Set 0 for OFF

In the *Viscosity Delay* field, enter a time (in seconds). During this time, the syringe plunger has a pause between the pumping and the injection stroke. For viscous samples, the pause allows the sample to flow into the vacuum created in the syringe.

Air gap: Field available only if the new Agilent 7693 autosampler is present. Enter in this field, the amount of air separating the sample from the end of the needle.

NOTE: The Air gap values accepted are actually syringe hundredths. For this reason, all values cannot be entered in this field. A message will be displayed if the value is not correct depending on the syringe size.

In the *Injection replicate* field (available for the new Agilent 7693 autosampler when LVI mode is selected), enter the number of injections that will be performed from the same sample, during the same analysis.

In the *Injection* field (available for the new Agilent 7693 autosampler when LVI mode is selected), enter the delay in seconds between two consecutive replicates.

Washes:

In the *Sample wash* field, enter the number of syringe washes with the sample, before injection.

In the *Sample wash volume* field, enter the percentage of the syringe volume that will be filled by the sample during the wash.

In the Solvent A and B Pre-wash fields, enter the number of syringe washes with solvent A and/or B, before injection. In the Solvent A and B Post-wash fields, enter the number of syringe washes with solvent A and/or B, after injection.

In the *Solvent A and B wash volume* fields, enter the percentage of the syringe volume that will be filled by the solvent A or B during the wash.

Dwell Time:

In the *Pre Dwell Time field,* enter the time in minutes the needle stays in the inlet before the injection. In the *Post Dwell Time field*, enter the time in minutes the needle stays in the inlet after the injection.

Speeds:

In the *Injection dispense speed* field, enter the speed of the syringe during injection.

In the *Sample draw speed* field, enter the speed of the syringe when drawing the sample from the vial.

In the S*ample dispense speed* field, enter the speed of the syringe when dispensing the sample in the waste, during the wash step.

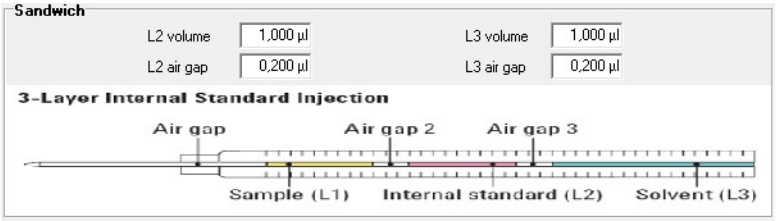
In the *Solvent draw speed* field, enter the speed of the syringe when drawing the solvent from the wash vial.

In the *Solvent dispense speed* field, enter the speed of the syringe when dispensing the solvent in the waste, during the wash step.

NOTE: The speeds values depend on the syringe size. All values will not be taken into account by the GC. For this reason, some values can be entered and the value on the GC can be a little different.

Sandwich:

In 2-layer Sandwich and 3-layer sandwich mode (only available with the new Agilent 7693 autosampler), a new part of the screen is displayed:



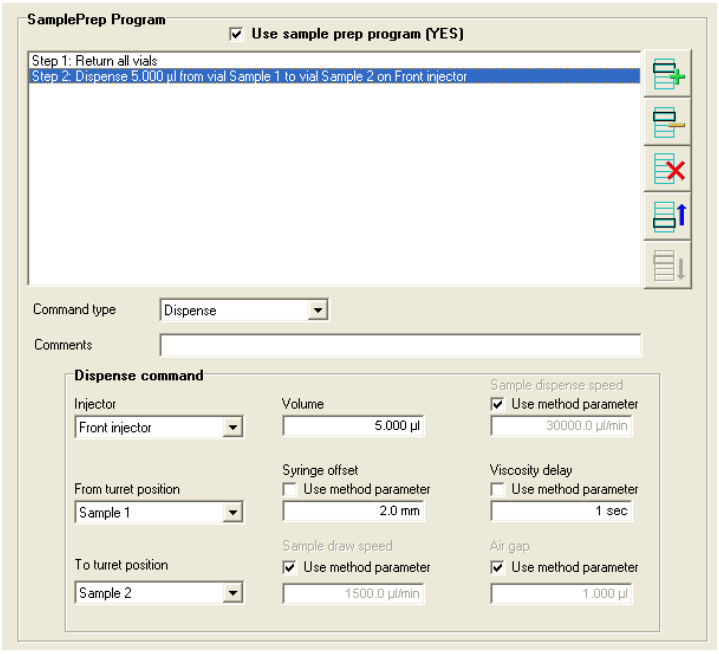
In the *L2 and L3 volume* fields, enter the amount of sample used in layer 2 and/or 3.

In the *L2 Air gap volume* fields, enter the amount of air used between sample layer 1 and sample layer 2. In the *L3 Air gap volume* fields, enter the amount of air used between sample layer 2 and sample layer 3.

NOTE: The Air gap and layer volume values accepted are actually syringe hundredths. For this reason, all values cannot be entered in this field. A message will be displayed if the value is not correct depending on the syringe size.

Sample preparation program

If the 7693 autosampler is installed with the sample tray, you can configure the autosampler to prepare or manipulate samples before running a method. All these sample preparation programs run before any other standard injection and post-injection program.



Several commands are available. For each one a series of parameters have to be set. Some of them can take the values defined in the Front/Back turret part of the method (check Use method parameter) or values entered by the user (uncheck Use method parameter).

Dispense:

The *Dispense* command transfers an amount of fluid from one turret position to another in the same turret. The following dispense parameters are available:

Injector: Select Front or Back injector depending on your configuration.

From turret position: Select the turret position from which you want to acquire the liquid.

To turret position: Select the turret position into which you will dispense the liquid.

Volume: Set the amount of liquid to dispense.

Syringe offset: Set the depth of the syringe needle in the vial.

Draw speed: Set the rate to draw liquid into the syringe.

Dispense speed: Set the rate to dispense liquid into the syringe.

Viscosity delay: Set the amount of seconds the plunger pauses to let the syringe fill with liquid.

Air gap: Set the amount of air that separates the liquid from the end of the needle.

Comments: Enter any information (optional).

Heat:

The *Heat* command controls the heater temperature and the heating time of the vial. The heater remains at the last temperature setting until a new heat step changes it.

The following Heat parameters are available:

Temperature: Define the temperature of the heater. It is possible to maintain the last temperature setting, to turn the heater off or to set a new temperature.

Time: Define the amount of time the vial is heated. It is possible to not wait for the vial to reach a specified temperature before continuing (*No wait* option).

NOTE: This command does not move the vial to and from the heater position. You must use the *Move vial* command before and after *Heat* in your preparation program.

Load:

The *Load* command moves the syringe into a vial and then the plunger to a specified position. It can also be used to fill a syringe and then to partially unload the content into several vials.

The following *Load* parameters are available:

From injector: Select Front or Back injector depending on your configuration.

From turret position: Select the turret position from which you want to acquire the liquid.

Syringe position: Set the syringe position.

Syringe offset: Set the depth of the syringe injection.

Plunger volume: Set the plunger volume to draw a specified volume of liquid into the syringe.

Plunger mode: The plunger volume can be measured by the travel of the plunger stroke (*Relative*) or by the syringe volume reading (*Absolute*).

Plunger speed: Set the rate to draw or dispense liquid.

Delay: Set the time the plunger pauses to let the syringe will with liquid.

Air gap: Set the amount of air that separates the liquid from the end of the needle.

EXAMPLES:

To transfer a liquid, use one *Load* command (relative) to fill the syringe and other *Load* command (absolute) to dispense the desired amounts of liquid into vials or into the inlet.

To dilute a sample, use one *Load* command to draw an amount of solvent and then a *Dispense* command to draw and dispense this mixture of sample and solvent.

To avoid air bubbles, use rather *Load* than *Dispense* as you can, with a Load command expel only a portion of syringe that contains no bubbles.

Mix Sample:

The *Mix Sample* command controls the mixer speed, the mixer direction, the time to mix a vial and the time to wait between mixing cycles.

The following *Mix Sample* parameters are available:

Mode: Set the type of mix cycle, for example bi-directional. *Number of cycles:* Define the number of mix cycles per vial. *Speed*: Define the number of rotations per minute.

Total mixing time: It corresponds to the sum of the mix time and dwell time multiplied by the number of mix cycles.

Mix cycle time: Define the amount of time to mix the vial per mix cycle.

Dwell time: Set the amount of idle time between mix cycles.

NOTE: This command does not move the vial to and from the mixer position. You have to use the *Move vial* command before and after *Mix Sample* in your preparation program.

Move Vial:

The *Move Vial* command instructs the tray to move a vial from one location to another.

From position: Select the position to take the vial.

To position: Select the position to put the vial.

Depending on the configuration of the autosampler, the following move positions may be available:

Tray vial: Select a vial from a fixed position in the rack.

Front or Back turret: Select one of the three transfer positions in the turret.

Heater: Specify the heater if available.

Mixer: Specify the mixer if available.

Pumps:

The *Pumps* command enables the user to perform sample pumps to wet a syringe before use. Pumps can reduce air bubbles in some samples.

The following Pumps parameters are available:

Injector: Select Front or Back injector depending on your configuration.

Turret position: Select the turret position in which you want to perform the pumps.

Number of pumps: Define the number of pumps.

Volume: Set the amount of liquid to draw and dispense. *Syringe offset:* Set the depth of the syringe needle in the vial. *Draw speed:* Set the rate to draw liquid into the syringe.

Dispense speed: Set the rate to dispense liquid into a vial.

Viscosity delay: Set the time the plunger pauses to let the syringe fill with liquid.

Return All:

The *Return All* command returns any vial in the turret, mixer or heater to its original position.

Wait:

The *Wait* command instructs the system to pause for a specified time before continuing with the next command. *Wait* can be used to allow a sample to cool or to hold while a reaction takes place.

Washes:

The *Washes* command draws liquid from one location and expels the entire amount into another location. The following *Washes* parameters are available:

Injector: Select Front or Back injector depending on your configuration.

Solvent wash bottle: Select the turret position from which you want to acquire the wash liquid.

Dispense to: Select the turret position into which you will dispense the liquid.

Number of washes: Select the number of times the syringe is washed.

Volume: Set the wash volume.

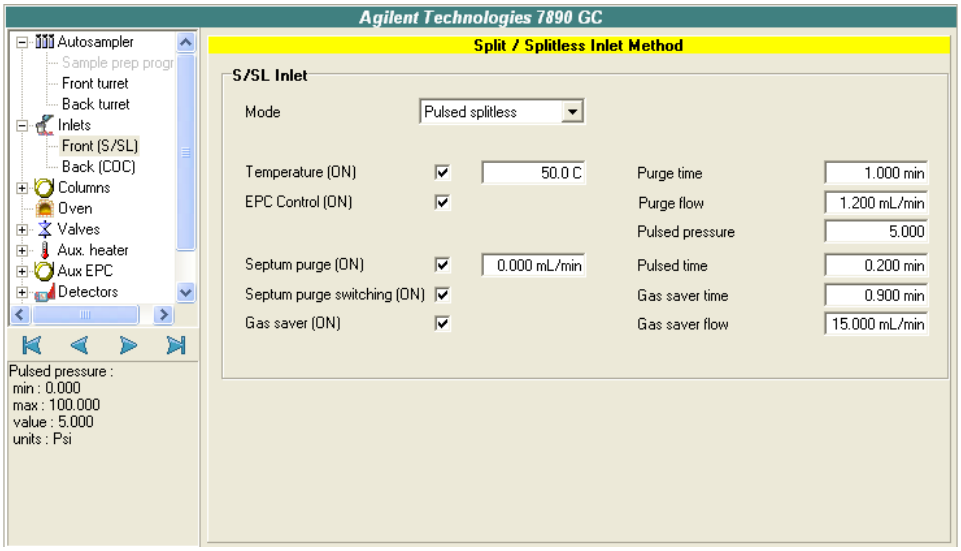
Syringe offset: Set the depth of the syringe injection. *Draw speed*: Set the rate to draw liquid into the syringe. *Dispense speed:* Set the rate to dispense liquid into a vial.

Viscosity delay: Set the time the plunger pauses to let the syringe fill with liquid.

Inlet Control

Depending on the system configuration, select the *Front* or *Back* inlet in the browser

Split/Splitless



Check the *Temperature* box to activate the inlet temperature. Enter the desired *Temperature*.

Check the *EPC Control* to activate it. The pressure has to be set in the Columns section. Inlet pressure is equal to the one of the associated column.

Select the *Injection mode*. The available choices are: *Split*, *Splitless*, *Pulsed split* and *Pulsed splitless*. According to this choice, the following parameters are activated or not.

In the *Septum purge* field, enter the flow in mL/min through the septum purge line. Select the *Septum purge switching* field to activate it.

In the *Total flow* field, enter the sum of the division flow, the column flow and the septum purge flow. This field is available only if the column parameters have not been defined onto the *GC*.

In the *Split ratio* field, enter the ratio between the flow division and column flow. This field is available only if the *Split* and

Pulsed Split inlets are selected.

In the *Purge time field*, enter the time the purge valve is opened. This field is available only if the *Splitless* and *Pulsed Splitless* inlets are selected.

In the *Purge flow* field, enter the flow of the purge vent in mL/min. This field is available only if the *Splitless* and *Pulsed Splitless* inlets are selected.

In the *Pulsed time* field, enter the time the pulsed pressure is maintained in the inlet. This field is available only if the Pulsed

Split and *Pulsed Splitless* inlets are selected.

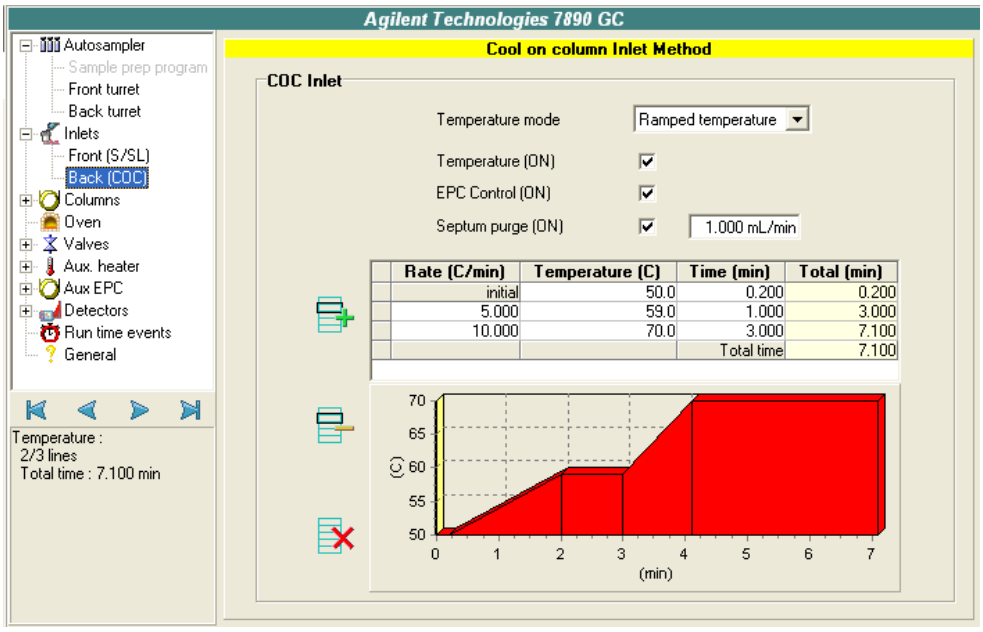
In the *Pulsed pressure* field, enter the inlet pressure when the acquisition starts. This field is available only if the Pulsed *Split* and *Pulsed Splitless* inlets are selected.

Check the *Gas saver* to activate the gas saver. This option is available only if the column parameters have been defined in the *Column* sub-section.

In the Gas s*aver time* field, enter the time the gas saver is activated. This time must be greater than the purge time for splitless injection and greater than the injection time for split injection.

In the Gas s*aver flow* field, enter the gas flow. It must at least equal to column flow, plus 15 mL/min.

Cool On Column

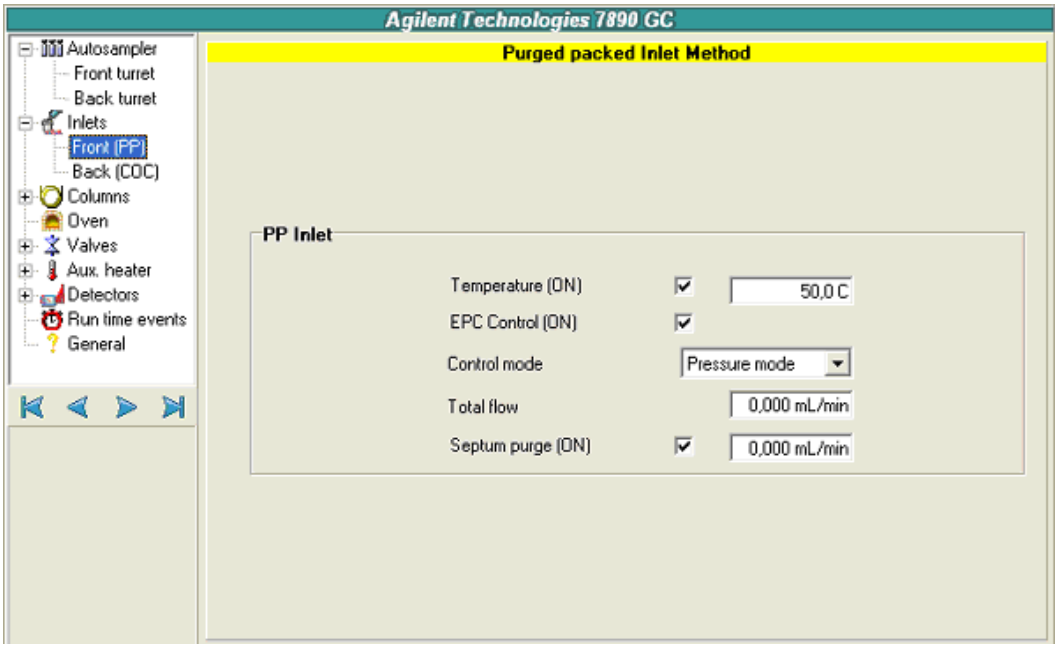


Check the EPC Control box to activate the inlet pressure. The pressure has to be set in the Columns section. Check the Temperature box to turn ON the thermal zone.

- Select the *Track column oven* to make the inlet temperature profile track the oven temperature. The difference between the two temperatures is 3°C.
- Select *Ramped temperature* to set the thermal zone program. In the *Temperature* field, enter the inlet temperature in °C.
- In the *Time* field, enter the time the inlet stays to the *Temperature* in minutes.
- In the *Rate* field, enter the rate in °C/min used to reach the next temperature set point. The total time of the inlet temperature program is displayed in the *Total* field.

The graphic displays the temperature program. Check Septum purge and define the flow in mL/min.

Purged Packed



Check the *Temperature* box to activate the inlet temperature. Enter the inlet temperature in °C.

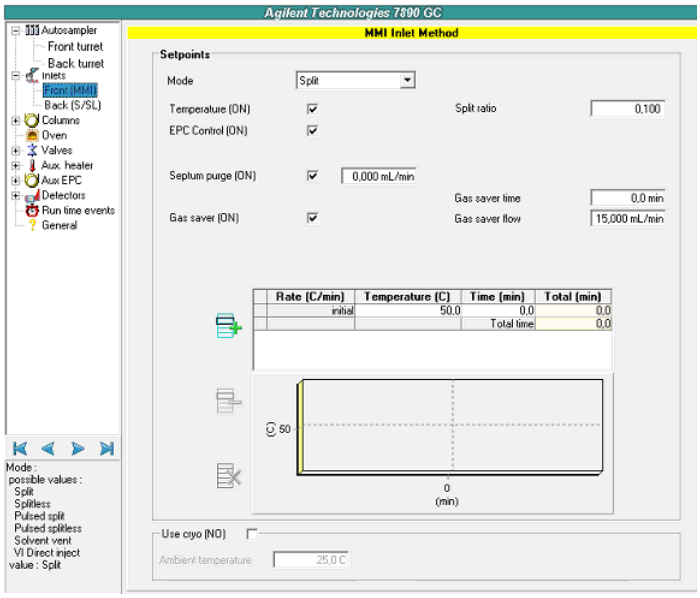
Check the *EPC Control* to activate it. The pressure has to be set in the *Columns* section. Inlet pressure is equal to the one of the associated column.

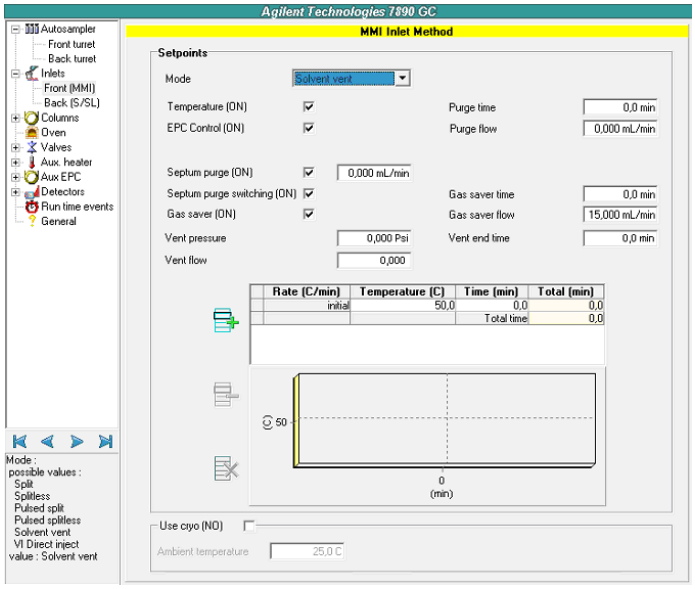
In the *Control mode*, select the desired pneumatic control mode (pressure mode, flow mode).

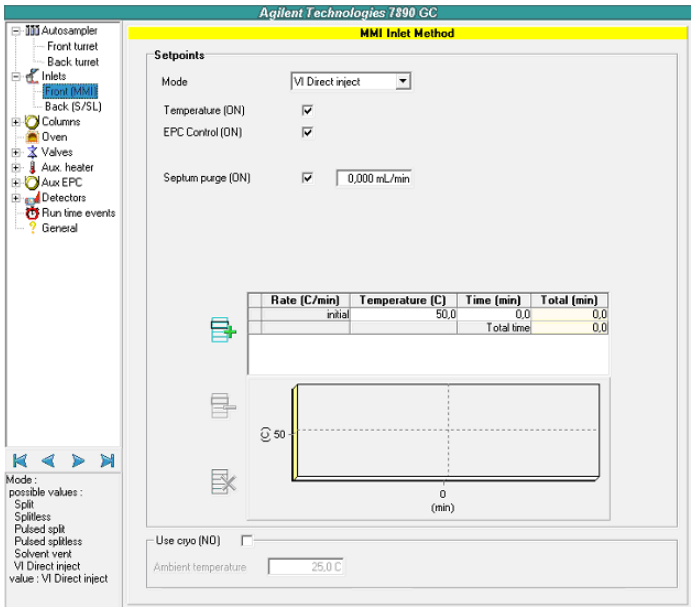
In the *Total flow* field, enter the sum of the division flow, the column flow and the septum purge flow. This field is available only if the column parameters have not been defined onto the *GC*.

In the *Septum purge* field, enter the flow in mL/min through the septum purge line.

Multi Mode Inlet (MMI)







The MMI inlet control screen uses the same one than the Slit/Splitless with a temperature program available and the Cryo available if needed.

Select the *Injection mode*. The available choices are: *Split*, *Splitless*, *Pulsed split*, *Pulsed splitless, Solvent vent and VI Direct inject*. Depending upon this choice, the following parameters are activated or not.

Split, Splitless, Pulsed split, Pulsed splitless

Please refer to the *Split/Splitless* inlet part of this manual.

In the *Temperature* field, enter the inlet temperature in °C.

In the *Time* field, enter the time the inlet stays to the *Temperature* in minutes.

In the *Rate* field, enter the rate in °C/min used to reach the next temperature set-point. The total time of the inlet temperature program is displayed in the *Total* field.

The graphic displays the temperature program.

Check the *Use cryo* box to activate the cyo, and set the ambient temperature.

Solvent vent mode:

Check the *Temperature* box to activate the inlet temperature. Enter the desired *Temperature*.

Check the EPC Control to activate it. The pressure has to be set in the Columns section. Inlet pressure is equals to the one of the associated column.

In the *Septum purge* field, enter the flow in mL/min through the septum purge line. Select the *Septum purge switching* field, to activate it.

In the *Total flow* field, enter the sum of the division flow, the column flow and the septum purge flow. This field is available only if the column parameters have not been defined onto the *GC*.

In the *Purge time field*, enter the time the purge valve is opened. This field is available only if the *Splitless* and *Pulsed Splitless* inlets are selected.

In the *Purge flow* field, enter the flow of the purge vent in mL/min. This field is available only if the *Splitless* and *Pulsed Splitless* inlets are selected.

In the *Total flow* field, enter the sum of the division flow, the column flow and the septum purge flow. This field is available only if the column parameters have not been defined onto the *GC*.

Check the *Gas saver* to activate the gas saver. This option is available only if the column parameters have been defined in the *Column* sub-section.

In the Gas s*aver time* field, enter the time the gas saver is activated. This time must be greater than the purge time for splitless injection and greater than the injection time for split injection.

In the Gas s*aver* f*low* field, enter the gas flow. It must at least equal to column flow, plus 15 mL/min.

In the *Vent pressure* field, enter the inlet pressure during the vent period. By decreasing the inlet pressure while venting, solvent elimination proceeds faster. Also, the pressure reduction decreases the amount of carrier gas and solvent vapor that enters the column during this time. If 0 is chosen, the inlet uses the lowest pressure possible at the given vent flow. Please refer the Instrument manual to know more about this feature in the GC.

In the *Vent flow* field, enter the flow of carrier gas out the split vent during the vent period.

In the *Vent end time* field, enter the time, measured from Start Run, when solvent venting ends. For large volume injections, this time is normally greater than the time for the injection to complete.

In the Temperature field, enter the inlet temperature in °C.

In the Time field, enter the time the inlet stays to the Temperature in minutes.

In the Rate field, enter the rate in °C/min used to reach the next temperature set-point. The total time of the inlet temperature program is displayed in the Total field.

The graphic displays the temperature program.

Check the Use cryo box to activate the cyo, and set the ambient temperature.

VI Direct Inject:

Check the Temperature box to activate the inlet temperature. Enter the inlet temperature in °C.

Check the EPC Control box to activate the inlet pressure. The pressure has to be set in the Columns section. In the Septum purge field, enter the flow in mL/min through the septum purge line.

In the *Temperature* field, enter the inlet temperature in °C.

In the *Time* field, enter the time the inlet stays to the *Temperature* in minutes.

In the *Rate* field, enter the rate in °C/min used to reach the next temperature set-point. The total time of the inlet temperature program is displayed in the *Total* field.

The graphic displays the temperature program.

Check the *Use cryo* box to activate the cryo, and set the ambient temperature.

Column Control

Depending on the system configuration, select the *column number* in the browser.

NOTE: If several columns are associated to the same inlet, only the first one can be configured. If selecting the other ones in the browser, the following sentence is displayed: *Warning: Another column is connected to the same Inlet. Column is ignored.*

If a column is not associated to an inlet in the GC configuration, the corresponding column screen is not available.

If *EPC Control* option is checked in the Inlet session *EPC Control: ON* is displayed. If *EPC Control* option is not checked in the Inlet session *EPC Control: OFF* is displayed.

The user can choose to work either in Pressure or Flow control. In both cases he can select either constant or ramped flow.

NOTE: If column parameters are not defined in the GC (Length, Diameter, Film thickness), the Flow option is not available

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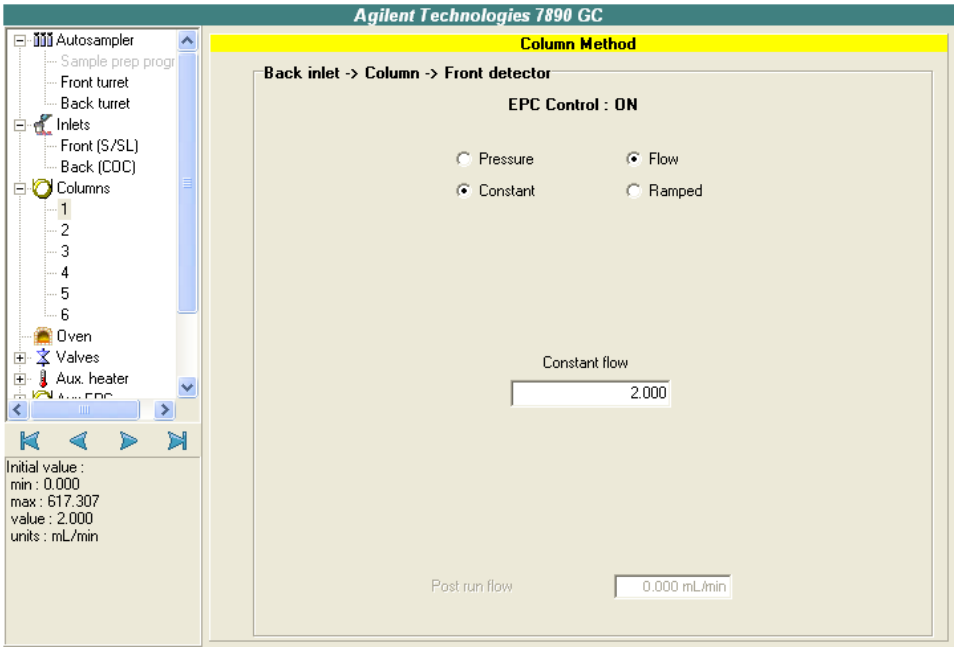
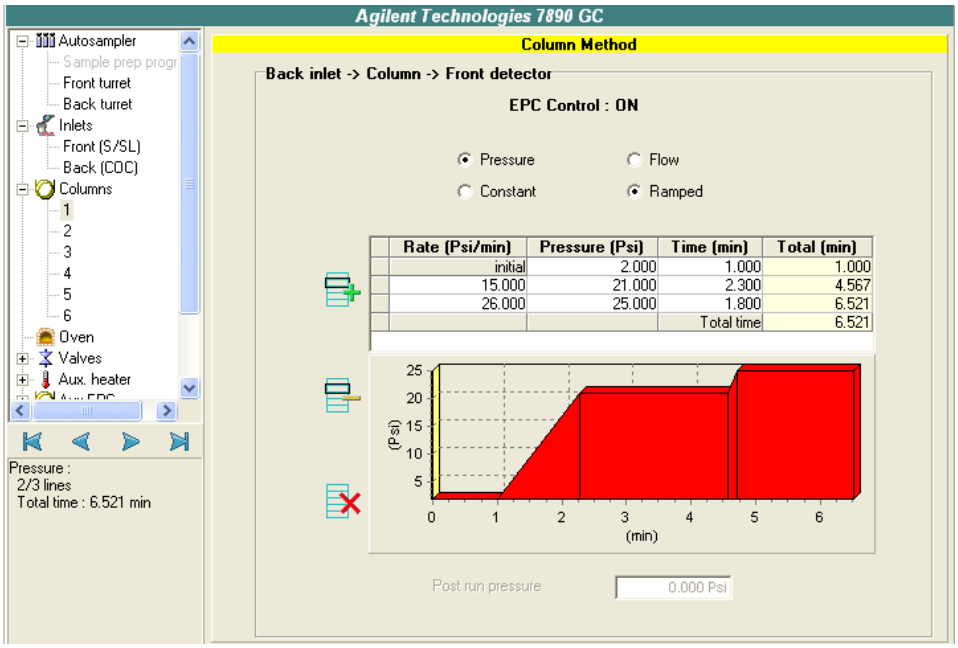


Select *Pressure* and *Constant* to maintain a constant pressure in the column. Then enter the corresponding pressure or flow in the *Pressure* or *Flow* fields.

Select *Flow* and *Constant* to maintain a constant flow in the column. Then enter the corresponding flow or pressure in the *Flow* or *Pressure* fields.

In case of *Ramped Pressure* or *Ramped Flow*, the user has to define the program in the table. The table is limited to four lines.



Select Pressure and Ramped to set a pressure program.

In the table program the rate, the plateau pressure, and the duration of the column plateau pressure. The graphic displays the pressure program.

The total time of the program is displayed in the Total field.

Define the pressure at the column ends in the Post run pressure field.

Select Flow and Ramped to set a flow program in the column.

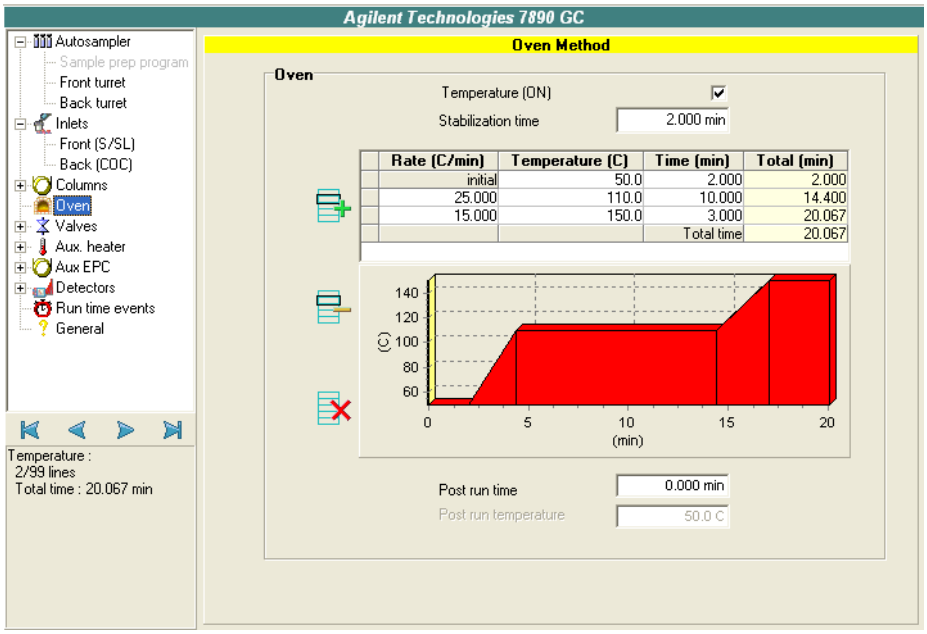
In the table program the rate, the plateau flow, and the duration of the column plateau flow. The graphic displays flow program.

The total time of the program is displayed in the Total field.

Define the flow during the post run period in the Post run flow field.

NOTE: Setting the Flow ramp, the limit of the column flow is [-150.000 .. 150.000]. The flow is not computed depending on the column size. It is the user's responsibility to set up a column flow that is correct for the column size.

Oven Control



Check the *Temperature* box to turn the oven ON and control its temperature. If the box is unchecked, all the following oven parameters will be grayed.

In the *Stabilization Time* field, enter the time before the GC becomes ready in minutes.

In the table, program the rates, the plateau temperatures, and the duration of the oven plateau temperature. The graphic below the table displays the oven temperature program.

The total time of the oven program is displayed in the *Total Time* field.

If a Cryogenic cooling is installed, the following parameters are displayed:

Use cryo: select this option to use the Cryogenic cooling.

Ambient temperature: This setpoint defines the temperature at which cryogenic cooling is enabled.

Fault detection: If the temperature has not been reached after 16 min of continuous Cryogenic operation, the oven is shutting down.

Timeout detection: If no run is started during the *Timeout* (min), the Cryo is shutting down to spare gas.

Timeout: timeout is used by the 'Timeout detection' option.

Quickcool: this option is used to cool the oven faster after a run than it would.

NOTE: If cryogenic module is used to cool the oven, the minimum limit of temperature authorized in the temperature table is decreased. The lower limit depends on the gas used for cryo. For example the lower limit if using N_2 is -80°C.

Post run time: set a time to have a post run period at the end of the normal run. If it is set to zero, no post run is done.

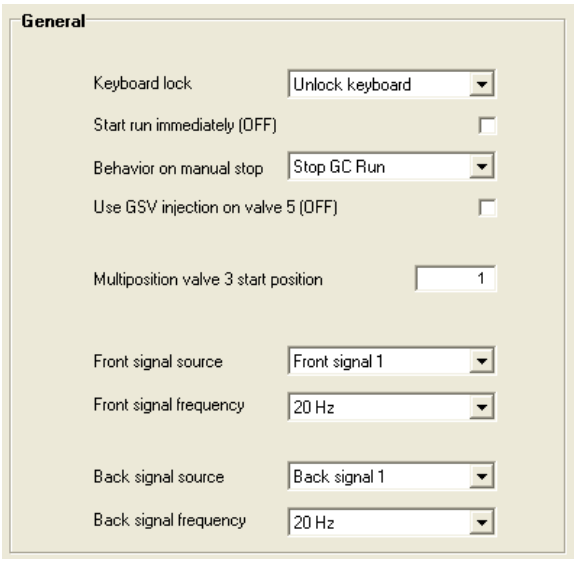
Post-run temperature: defines the oven temperature during the post run period.

Valves Control

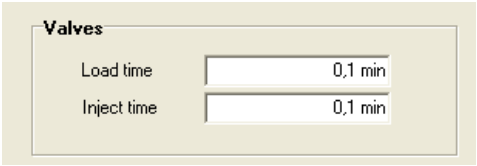
The instrument can have up to eight valves configured. The different fields depend on system configuration. Four types of valves exist: G*as sampling, Multiposition*, *Remote start* and *Switching valves*.

Multiposition Valve Parameters

No parameter has to be set in the Valves section of the control method. The valve start position has to be set in the General section.



Gas Sampling Valve Parameters



In the *Load time* field, enter the time the valve stays in load position.

In the *Inject time* field, enter the time the valve stays in inject position. As soon as the inject time begins, the acquisition starts.

Remote start Valve Parameters

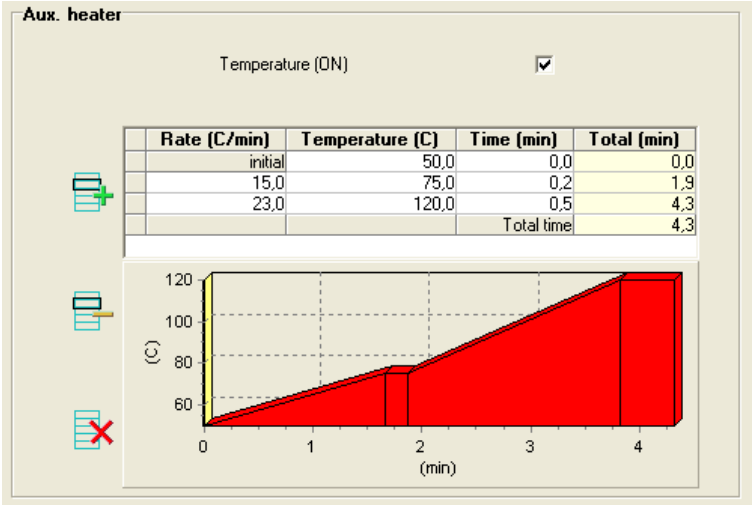
No parameter has to be set.

Switching Valve Parameters

Check the Valve On checkbox to activate the valve. It allows the switching of the valve from one position to another. An event can be added in the event table to switch the valve during a run.

Auxiliary heaters Control

Three auxiliary heaters can be configured, for each one the following screen is displayed:



Check the *On* box to enable temperature programming.

In the *Initial Temperature* field, enter the initial temperature in °C.

In the *Initial Time* field, enter the time the heater block stays to the *Initial Temperature* (first plateau) in minutes.

In the table program the rates, the plateau temperatures, and the duration of the heater block plateau temperature. The graphic displays the temperature program.

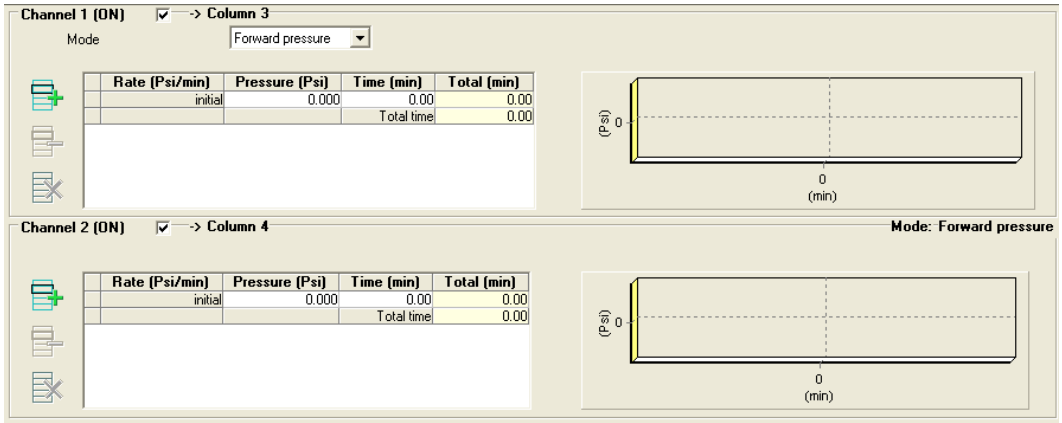
The total time of the heater block program is displayed in the *Total Time* field.

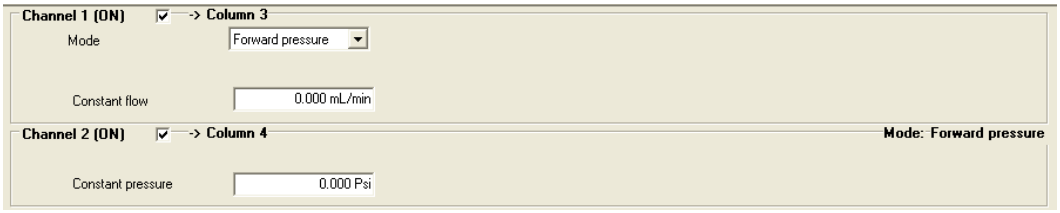
Pressure Control Module

Three PCM modules can be defined (A, B and C). Each PCM owns two independent control channels.

Channel 1 is a simple forward pressure regulator channel that maintains constant the flow or the pressure thanks to a flow sensor or a pressure sensor.

Channel 2 may be used in two modes: forward pressure regulator or back pressure regulator. The configuration has to be defined on the GC, and cannot be modified within the method.





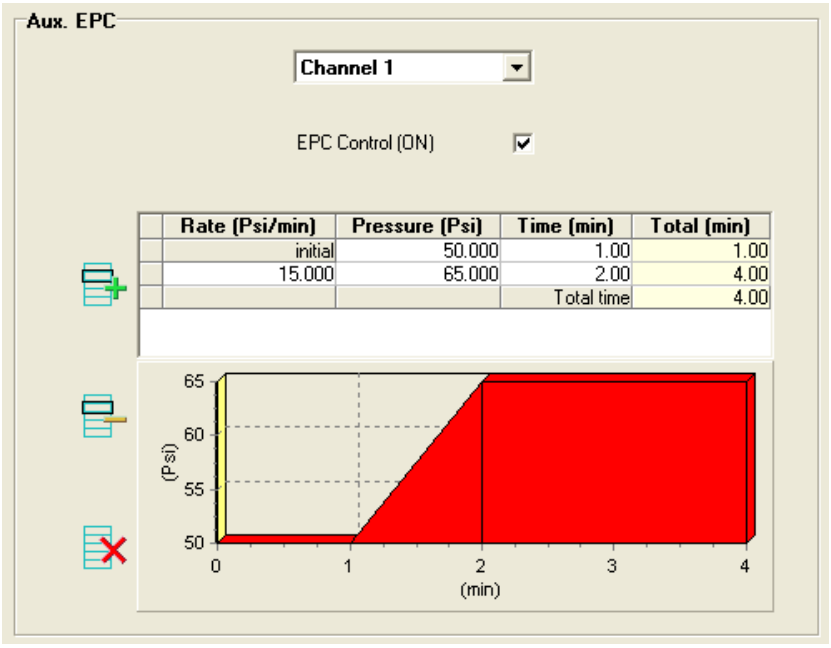
In channel 1 section, select Forward pressure or Flow pressure either you want to fix the pressure or the flow.

In channel 2, only pressure program or constant pressure can be defined. The mode (forward or back pressure) is indicated but cannot be modified from the method.

In the case a column is linked to a PCM in INPUT, the corresponding column screen is linked to the PCM screen, that means that pressure or flow values are identical in both PCM and column screens.

Auxiliary Pressure Control

Three channels are available by Aux. EPC, for each channel the following screen is displayed:



Select the channel to configure into the scrolling list. Then check the ON box to enable EPC Control. In the Initial Pressure field, enter the initial pressure in Psi.

In the Initial Time field, enter the time the EPC block stays to the Initial Pressure (first plateau) in minutes. In the table program the rates, the pressures, and the duration of the EPC block plateau pressure.

The graphic displays the pressure program.

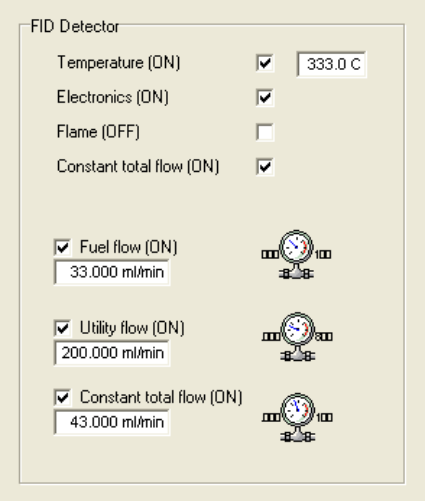
The total time of the EPC block program is displayed in the Total Time field.

Detector Control

Depending on the system configuration, select the Front or Back button, to set the information for each detector. The different fields depend on system configuration.

Auxiliary detectors have to be configured in the detectors part of the method. Aux Det 1 can only be a TCD (Thermal Conductivity detector). Aux Det2 can only be an AIB (Analog Input Board).

FID (Flame Ionization Detector)



Check the *Temperature* box if the temperature control will be used. If the temperature control is ON, define the value in the corresponding field.

Check the *Electronics* box if the electronics control will be used.

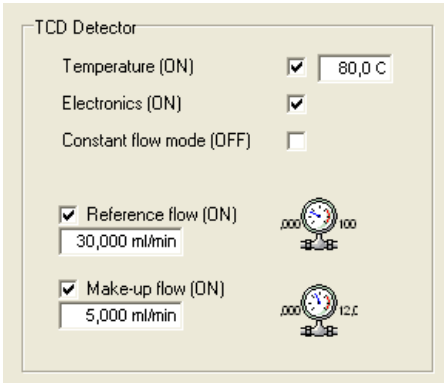
Check the *Flame* box if the method requires to switch the detector flame on.

Check the *Constant total flow* box if the method requires that the total flow (i.e., Make-Up Flow + Column Flow) is constant. Check the *Fuel Flow* box, to control this flow and define the constant value in the corresponding field.

Check the *Utility Flow* box, to control this flow and define the constant value in the corresponding field.

Check the *Make-up (or Constant total) Flow* box, to control this flow and define the constant value in the corresponding field.

TCD (Thermal Conductivity Detector)



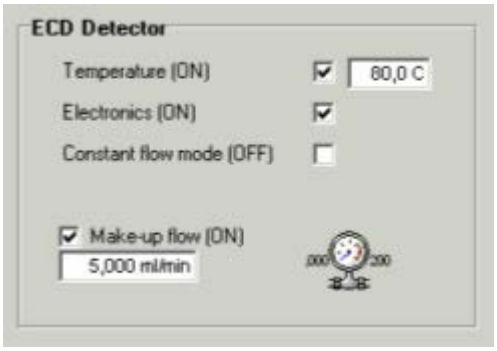
Check the *Temperature* box if the temperature control will be used. If the temperature control is ON, define the value in the corresponding field.

Check the *Electronics* box if the electronics control will be used.

Check the *Constant total flow* box if the method requires that the total flow (i.e., MakeUp Flow + Column Flow) is constant. Check the *Reference Flow* box, to control this flow and define the constant value in the corresponding field.

Check the *Make-up (or Constant total) Flow* box, to control this flow and define the constant value in the corresponding field.

ECD (Electron Capture Detector)

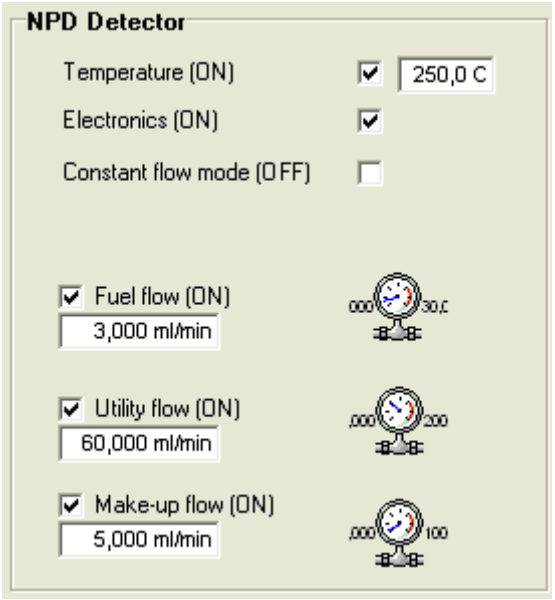


Check the *Temperature* check box to turn the heater ON and define the expected temperature. Check the *Electronics* check box to turn the electrometer ON

Check the *Constant flow* ON check box to force the *Make-Up Flow* + *Column Flow* to be constant. The *Constant total flow* field appears. Define the expected Total flow in mL/min.

Check the *Make-up flow* check box and define a flow if you want to use a make-up gas.

NPD (Nitrogen Phosphorous Detector)



Check the *Temperature* box if the temperature control will be used. If the temperature control is ON, define the value in the corresponding field.

Check the *Electronics* box if the electronics control will be used.

Check the *Constant total flow* box if the method requires that the total flow (i.e., Make-Up Flow + Column Flow) is constant. Check the *Fuel Flow* box, to control this flow and define the constant value in the corresponding field.

Check the *Utility Flow* box, to control this flow and define the constant value in the corresponding field.

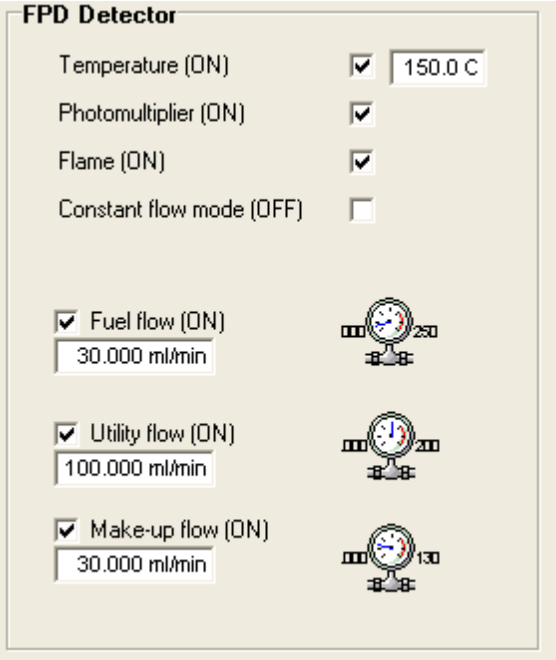
Check the *Make-up (or Constant total) Flow* box, to control this flow and define the constant value in the corresponding field.

NOTE: The *Bead Voltage value used* to heat the bead is not controlled by the driver, the value has to be set on the GC.

AIB (Analog Input Board)

AIB detector is used to recover an analog signal from a non-Agilent detector or other source. The AIB convert the analog signal into a digital signal. No dedicated parameter has to be set in the method, except the acquisition frequency (general section).

FPD (Flame Photometric Detector)



Check the *Temperature* box if the temperature control will be used. If the temperature control is ON, define the value in the corresponding field.

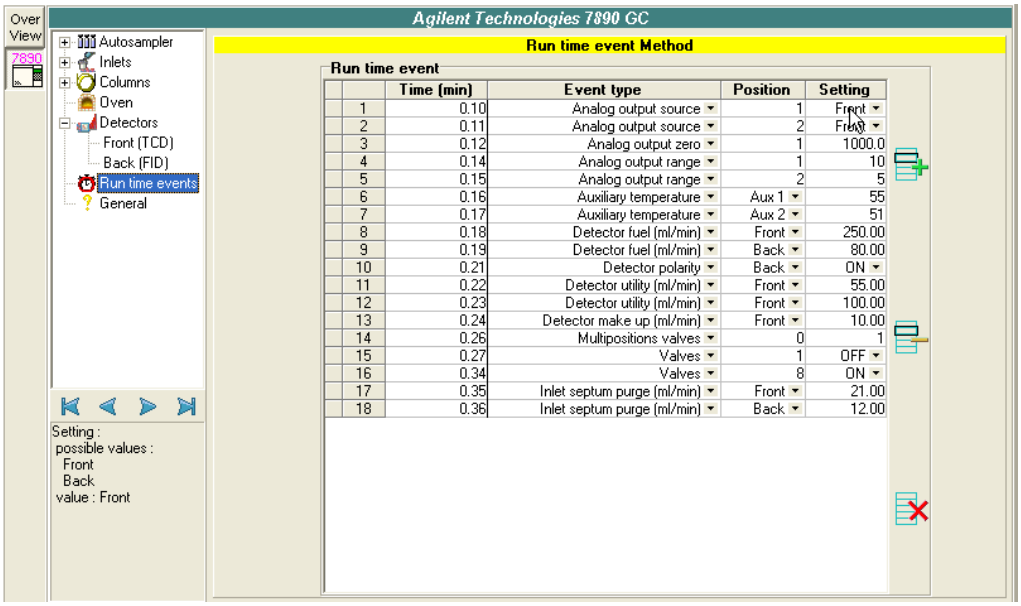
Check the Photomultiplier (*PMT)* box if the electronics control will be used. Check the *Flame* box if the method requires to switch the detector flame on.

Check the *Constant total flow* box if the method requires that the total flow (i.e,. Make-Up Flow + Column Flow) is constant. Check the *Fuel Flow* box, to control this flow and define the constant value in the corresponding field.

Check the *Utility Flow* box, to control this flow and define the constant value in the corresponding field.

Check the *Make-up (or Constant total) Flow* box, to control this flow and define the constant value in the corresponding field.

Events Control


Agilent Technologies 7890 GC
Over View
Autosampler
Inlets
Columns
Oven
Detectors
Front (TCD)
Back (FID)
Run time events
General
Setting :
possible values :
Front
Back
value : Front
Run time event Method
Run time event
Time (min) | Event type | Position | Setting
1 | 0.10 | Analog output source | 1 | Front
2 | 0.11 | Analog output source | 2 | Front
3 | 0.12 | Analog output zero | 1 | 1000.0
4 | 0.14 | Analog output range | 1 | 10
5 | 0.15 | Analog output range | 2 | 5
6 | 0.16 | Auxiliary temperature | Aux 1 | 55
7 | 0.17 | Auxiliary temperature | Aux 2 | 51
8 | 0.18 | Detector fuel (ml/min) | Front | 250.00
9 | 0.19 | Detector fuel (ml/min) | Back | 80.00
10 | 0.21 | Detector polarity | Back | ON
11 | 0.22 | Detector utility (ml/min) | Front | 55.00
12 | 0.23 | Detector utility (ml/min) | Front | 100.00
13 | 0.24 | Detector make up (ml/min) | Front | 10.00
14 | 0.26 | Multipositions valves | 0 | 1
15 | 0.27 | Valves | 1 | OFF
16 | 0.34 | Valves | 8 | ON
17 | 0.35 | Inlet septum purge (ml/min) | Front | 21.00
18 | 0.36 | Inlet septum purge (ml/min) | Back | 12.00

In this table program events like valve switching, detector gas flow, TCD polarity change, etc.

NOTE: If the valve rotation is programmed with the event table, it would be better to program the initial position at the end of the analysis.

Use the following buttons to edit the table:

to add a line to the table

to delete a line in the table

to clear the entire table

In the Time column, enter the time when the action has to be done.

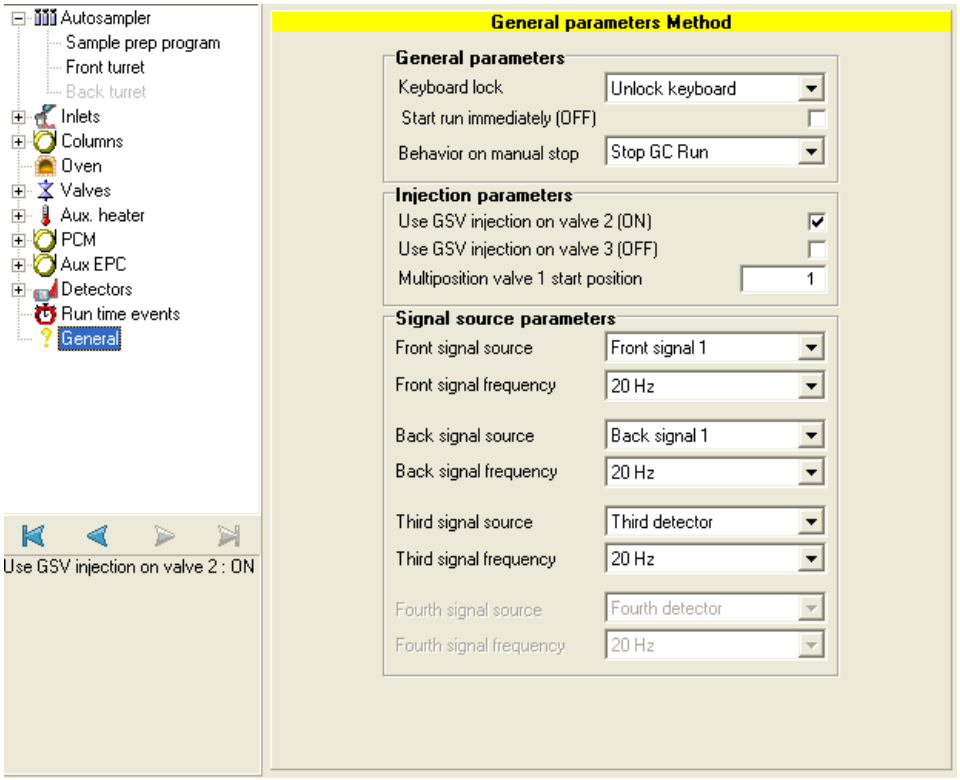
In the Action column, select the action to do. The available choices are:

Analog output source
Analog output auto-zero
Analog output range
Auxiliary temperature
Detector polarity
Detector fuel (=gas 1) (mL/min)
Detector utility (=gas 2) (mL/min)
Detector make up (=gas 3) (mL/min)
Multiposition valve
Valves
Inlet septum purge (mL/min)

In the Position column, select the expected position: Front/Back, ON/OFF, valve #, Aux # …

In the Parameter column, define the expected value / setting.

General Control



Select the lock keyboard mode. 3 choices are available:

Unlock keyboard: All the buttons on the GC front panel are available (including [START], [STOP] …) and all parameters can be edited (temperature set points, flows …).

Lock entire keyboard: no parameter can be edited (temperature set points, flows …) and no action can be done: [START], [STOP] buttons are not active.

Lock keyboard, Start allowed: no parameter can be edited (temperature set points, flows …) and the only action that can be performed is the start of a run: the [START] button is the only active one.

Check ***Start Run Immediately*** to launch an analysis as soon as the GC is ready, without manually starting the GC (with GSV gas sampling valve).

In the ***Behavior on manual stop*** section, select in the scrolling list the expected GC behavior after a manual stop of the run (from CompassCDS acquisition view). If “Let GC continue run” is selected, the GC will complete its oven time program, if “Stop GC run” is selected, the GC will immediately stop its oven program and the system is immediately turned to “Idle”.

Activate or not the ***Use GSV injection on valve X*** section, to inject the sample from a Gas Sampling valve instead of a manual injector or an autosampler.

In the ***Multiposition valve X start*** section, define the position in which the Multiposition valve must be turn on before the injection.

In the ***signal source*** fields, select the acquired signal on the corresponding channel from the list.

Select the acquisition frequency in the *signal frequency* field. The available choices are: *5, 10, 20*, *50*, *100, 200* or *500 Hz*.

Starting and Viewing an Acquisition

Quick Start and Sequence

Once the instrument control method has been correctly programmed, an analysis can be started. The next section briefly describes how to start an acquisition.

IMPORTANT NOTE: The 7890 is by default in “Auto Prep Run” mode. This prevents any download of CompassCDS methods, thus, any acquisition. Before starting an acquisition, it is then required to remove this setting. To do so, on the GC, press the Config button and edit the Instrument menu. Change the setting of the Auto Prep Run parameter to Off.

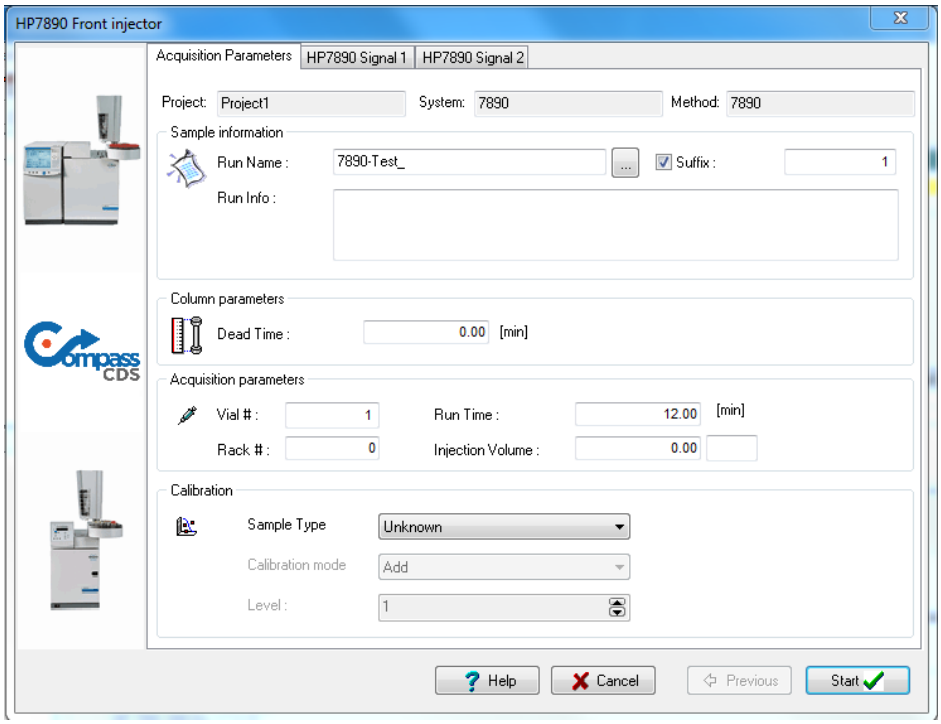
Quick Start (Single Acquisition)

Press the button.

In the Quick Start window, select the system, the method and optionally the project if connected in "All project" mode.

Press the OK button.

The following screen is displayed:



In the *Acquisition parameters* tab, required fields like the *Run Name*, the *Run ID* and the *Acquisition length* must be filled in before starting an analysis. Furthermore, if the system is equipped with an autosampler controlled by the CompassCDS Chromatography Data System, the *Injection Volume*, the *Vial* position and the *Rack* number (if required) must be entered.

Other parameters associated with each acquisition channel can be entered in the *Channel X* tab.

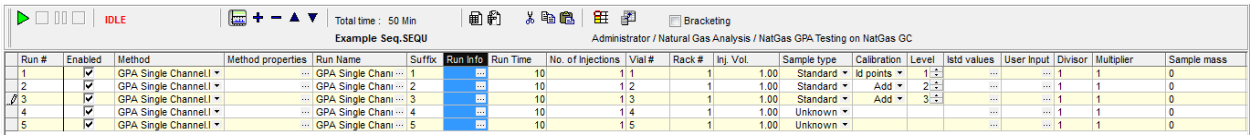
NOTE: The volume that will be injected depends on the Autosampler model (if one is controlled by CompassCDS). See Appendix for details.

Click on the Start button to start the acquisition if the system is a single-injector system or click on the Next button if the system is a multiple injector system. In a multiple injector system, the same parameters entered for the first injector must be entered for the other injectors before starting the acquisition.

Sequence

To create a sequence, select the FILE / NEW SEQUENCE menu, and complete the displayed creation wizard screen (refer to the CompassCDS Chromatography Data System User Guide), by entering the system name that will perform the analysis, the number of lines (corresponding to the number of samples), and the sequence name.

The sequence is displayed. Complete the sequence information columns (refer to the CompassCDS Chromatography Data System User Guide).



Run #	Enabled	Method	Method properties	Run Name	Suffix	Run Info	Run Time	No. of Injections	Vial #	Rack #	Inj. Vol.	Sample type	Calibration	Level	Istd values	User Input	Divisor	Multiplier	Sample mass
1	☑	GPA Single Channel.I		GPA Single Chani	1		10	1	1	1	1.00	Standard	Id points	1			1	1	0
2	☑	GPA Single Channel.I		GPA Single Chani	2		10	1	2	1	1.00	Standard	Add	2			1	1	0
3	☑	GPA Single Channel.I		GPA Single Chani	3		10	1	3	1	1.00	Standard	Add	3			1	1	0
4	☑	GPA Single Channel.I		GPA Single Chani	4		10	1	4	1	1.00	Unknown					1	1	0
5	☑	GPA Single Channel.I		GPA Single Chani	5		10	1	5	1	1.00	Unknown					1	1	0

The *Method Name*, the *Run Name*, the *Run ID,* and the *Acquisition length* must be filled in before starting the analysis. All these parameters are automatically imported from the acquisition part if defined in the method.

Start the sequence by clicking on the button.

NOTE: For more details about how to start an acquisition, refer to the CompassCDS User Guide.

NOTE: The volume that will be injected depends on the Autosampler model (if one is controlled by CompassCDS). See Appendix for details.

Running Acquisition Status

Viewing a Running Acquisition

To view a running acquisition, click on the *Systems* tab then select the running system. A window is activated which is composed of two parts: the running chromatogram and the status window where the driver modules are listed.

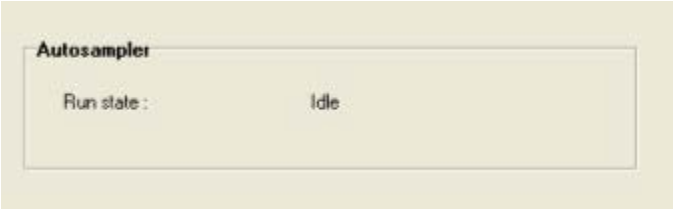
Status of the Agilent 7890 Gas Chromatograph

Click on the

button corresponding to the Agilent 7890 Gas Chromatograph driver and the Agilent Technologies 7890 Gas Chromatograph status screen will appear.

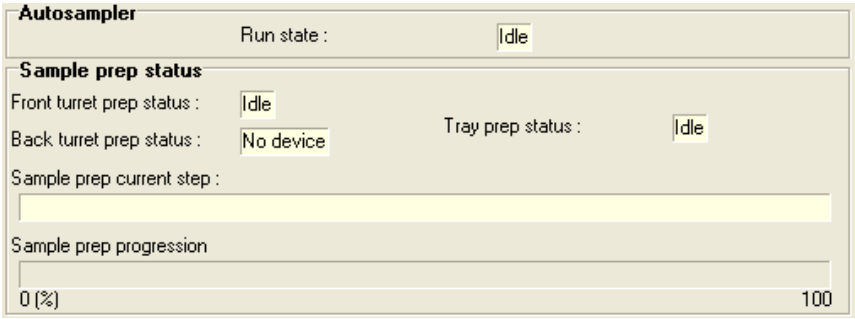
Click on the correct node in the tree-view to display the corresponding screen.

Autosampler:



The actual autosampler state is displayed.

If a 7693 autosampler is installed (prep sample option), the status displays the following information:

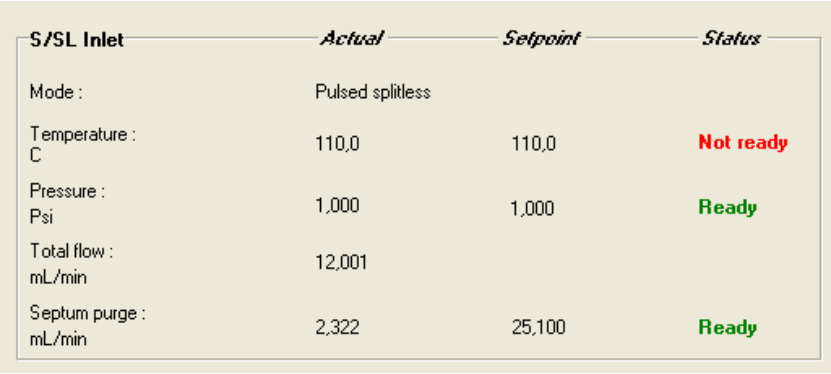


The Sample prep current step displays the action realized by the autosampler, corresponding to the sample prep program defined in the method.

The sample prep progression field displays the evolution of the sample preparation (number of steps done / total number of step).

Inlets:

Split / Splitless



The actual and setpoint values of the Inlet Temperature are displayed.

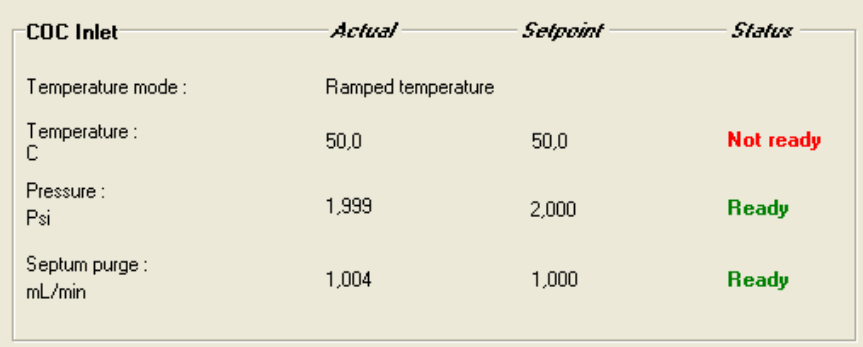
The actual and setpoint values of the Inlet Pressure are displayed. The pressure is the same than the one of the associated column.

The total flow is displayed.

The actual and setpoint values of the Inlet Septum purge are displayed.

The status of each parameter is also clearly displayed. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

Cool on-column



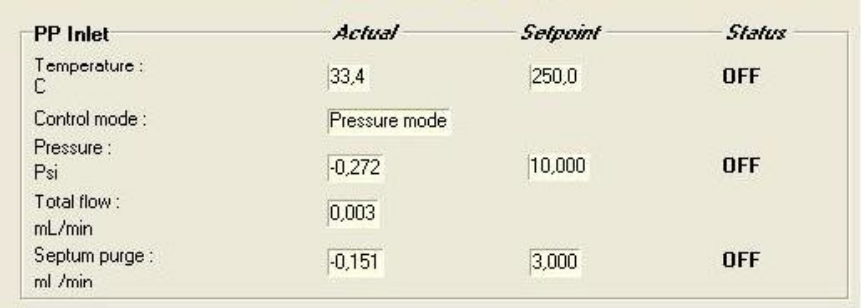
The actual and setpoint values of the Inlet Temperature are displayed.

The actual and setpoint values of the Inlet Pressure are displayed. The pressure is the same than the one of the associated column.

The actual and setpoint values of the Inlet Septum purge are displayed.

The status of each parameter is also clearly displayed. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

Purged Packed inlet

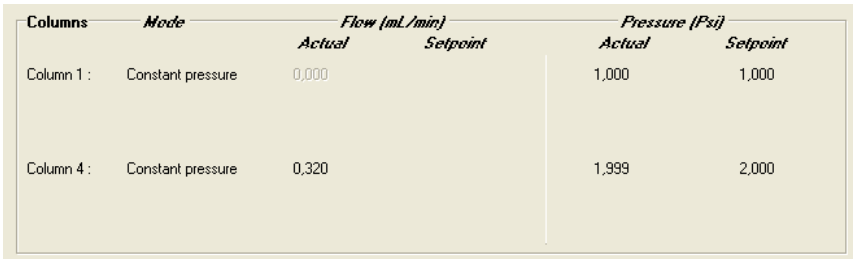


The actual and setpoint values of the Inlet Temperature are displayed. The control mode is displayed.

The actual and setpoint values of the Inlet Pressure are displayed.

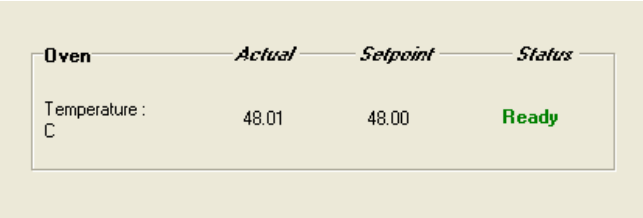
The actual and setpoint values of the Inlet Septum purge are displayed.

Columns:



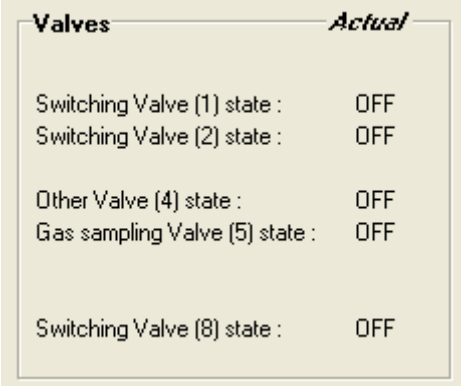
For each connected column, the Actual Flow and Pressure are displayed. Only the Setpoint (Flow or Pressure) defined in the method is displayed (Flow Setpoint if in Constant or ramped flow, Pressure Setpoint if in constant or ramped pressure).

Oven:



The current value of the temperature and the setpoint are displayed. The status (Ready / Not ready) is also displayed.

Valves:

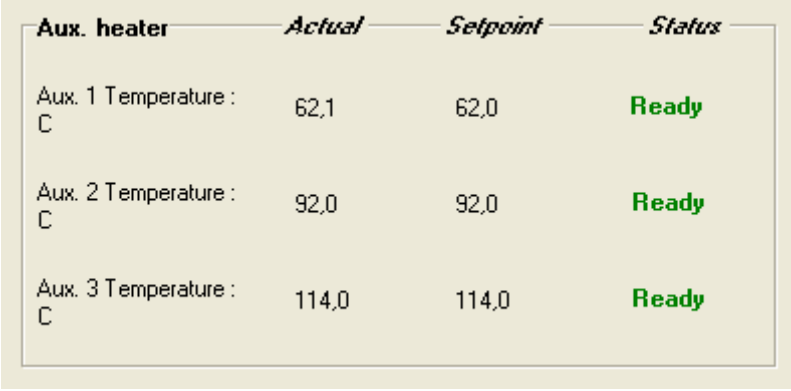

Valves
Actual
Switching Valve (1) state : OFF
Switching Valve (2) state : OFF
Other Valve (4) state : OFF
Gas sampling Valve (5) state : OFF
Switching Valve (8) state : OFF

The state (ON or OFF) of the valves is displayed in the status.

For *Gas Sampling Valve*, the state is OFF during the Load Time, and ON during the Inject Time period (both times values are defined in the method).

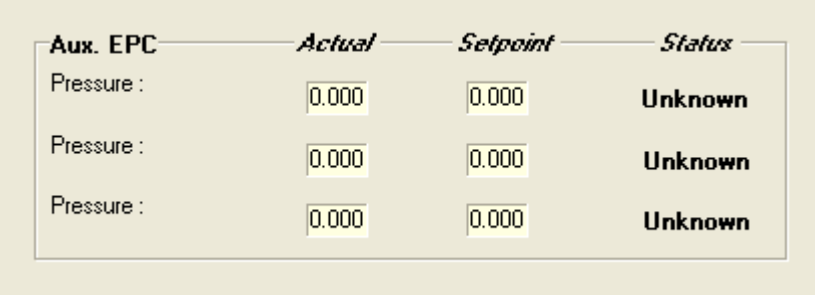
No information is displayed on the Multiposition valve.

Auxiliary Heater:



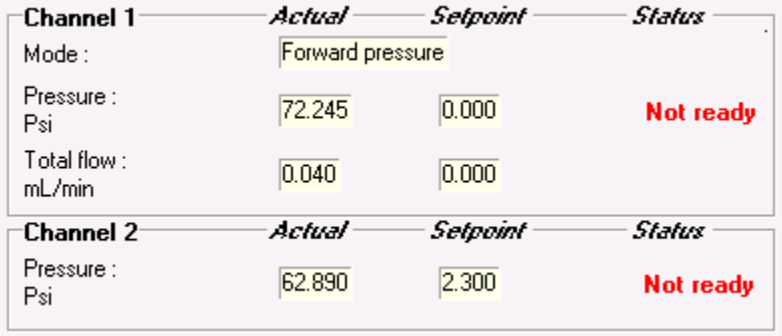
The current value of the temperature and the setpoint are displayed for each auxiliary heater. The status (Ready / Not ready) is also displayed.

Auxiliary Pressure Control (Aux EPC):



The current value of the pressure and the setpoint are displayed for each auxiliary pressure control. The status (Ready / Not ready/Unknown) is also displayed.

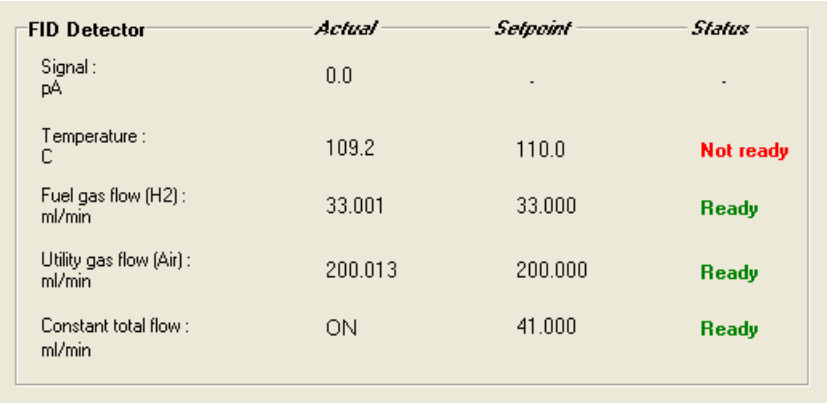
Pressure Control Module (PCM):



The current value of the pressure and the setpoint are displayed for each PCM channel. For channel 1 Flow setpoint and actual values are also displayed. The status (Ready / Not ready/Unknown/OFF) is precised.

Detectors:

FID



The current value of the signal is displayed in pA.

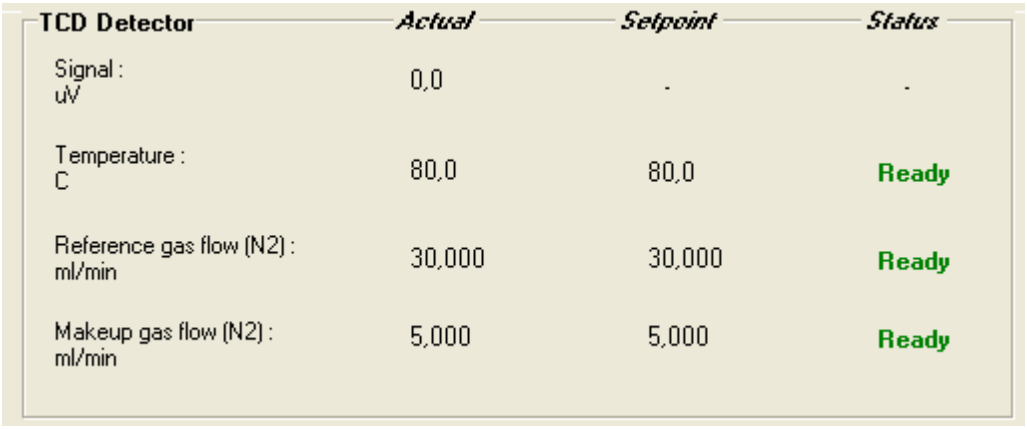
The actual and setpoint values of the detector Temperature, Fuel gas flow and Utility gas flow are displayed.

The status of each parameter is also clearly displayed. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

If the method specifies that the total flow has to be constant, this setting is ON, the setpoint value is displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

If the method specifies that the total flow is not constant, the actual and setpoint values of the Makeup gas flow are displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method):

TCD



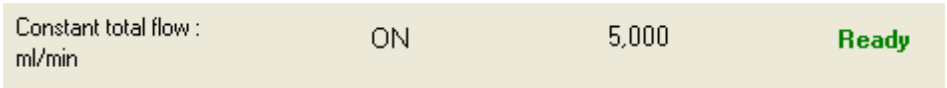
The current value of the signal is displayed in µV.

The actual and setpoint values of the detector Temperature, reference gas flow and make-up gas flow or Constant total flow are displayed.

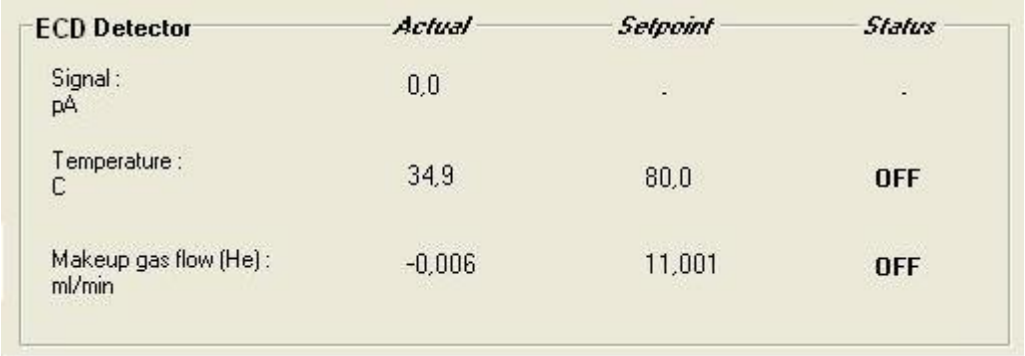
The status of each parameter is also clearly displayed. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

If the method specifies that the total flow has to be constant, this setting is ON, the setpoint value is displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

If the method specifies that the total flow is not constant, the actual and setpoint values of the Makeup gas flow are displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is activated in the method):



ECD



The current value of the signal is displayed in pA.

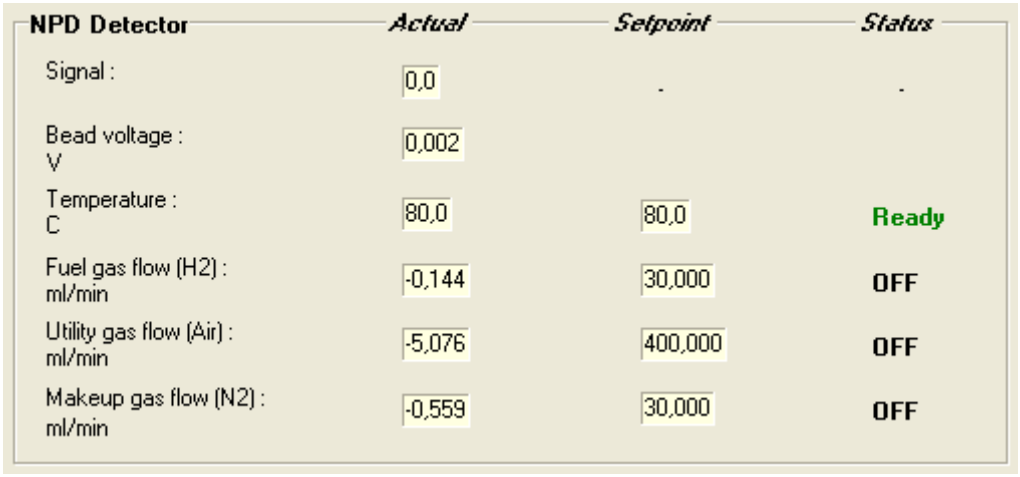
The actual and setpoint values of the detector Temperature and make-up gas flow or Constant total flow are displayed.

The status of each parameter is also clearly displayed. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

If the method specifies that the total flow has to be constant, this setting is ON, the setpoint value is displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

If the method specifies that the total flow is not constant, the actual and setpoint values of the Makeup gas flow are displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is activated in the method):

NPD

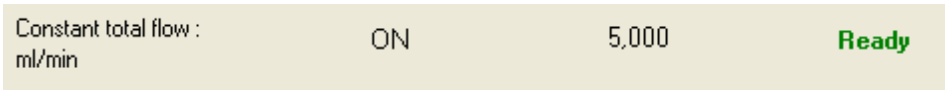


The current value of the signal is displayed.

The Bead Voltage actual value, the actual and setpoint values of the detector Temperature, Actual and setpoint Fuel gas flow and Utility gas flow are displayed.

The status of each parameter is also clearly displayed. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

If the method specifies that the total flow has to be constant, this setting is ON, the setpoint value is displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).



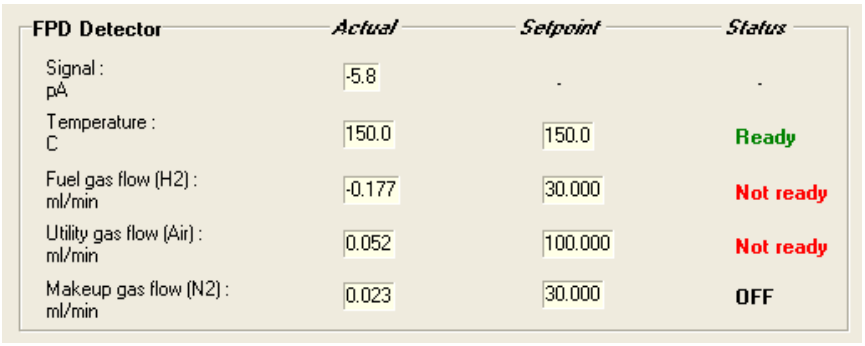
If the method specifies that the total flow is not constant, the actual and setpoint values of the Makeup gas flow are displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method):

Aux detectors

Aux detector 1 is necessarily a TCD , refer to the TCD section for status.

Aux detector 2 is necessarily an AIB. Only the signal value is displayed:

FPD



The current value of the signal is displayed in pA.

The actual and setpoint values of the detector Temperature, Fuel gas flow and Utility gas flow are displayed.

The status of each parameter is also clearly displayed. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

If the method specifies that the total flow has to be constant, this setting is ON, the setpoint value is displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method).

If the method specifies that the total flow is not constant, the actual and setpoint values of the Makeup gas flow are displayed as well as its Status. It can be Ready / Not ready / Off (if the control of the parameter is not activated in the method):

Overview Window

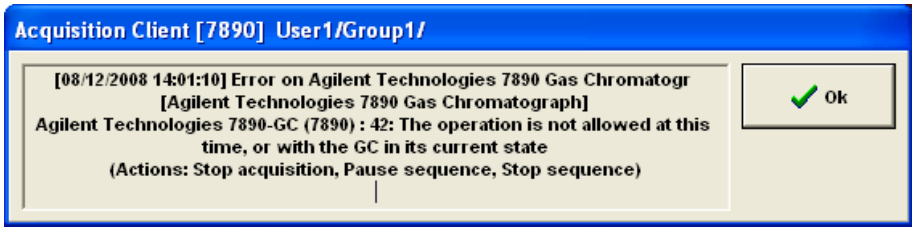
Click on the

button: for 7890 GC, nothing is displayed.

Troubleshooting

Error message when downloading a method

If the following error message is displayed during the download of a method:


Acquisition Client [7890] User1/Group1/
[08/12/2008 14:01:10] Error on Agilent Technologies 7890 Gas Chromatogr
[Agilent Technologies 7890 Gas Chromatograph]
Agilent Technologies 7890-GC (7890) : 42: The operation is not allowed at this time, or with the GC in its current state
(Actions: Stop acquisition, Pause sequence, Stop sequence)
Ok

It is because the 7890 is by default in “Auto Prep Run” mode. This prevents any download of CompassCDS methods, thus, any acquisition.

It is then required to change this setting.

To do so, on the GC, press the Config button and edit the Instrument menu. Change the setting of the Auto Prep Run parameter to Off.

Appendix

Injection Volumes

The volume injected depends on the Autosampler model (if one is controlled by CompassCDS).

If an Agilent 7683 autosampler (old model, until the G2913 turret) is present, the injection volume corresponds to syringe stops (1 to 6).

If an Agilent 7693 autosampler (new model, since the G4513 turret) is present, the injection volume will be entered in micro liters, and the available values will depend on the syringe size.

7683 autosampler model (G2613, G2913 turret)

	Value entered in the *Injection Volume* field of the acquisition method	Corresponding % of the syringe volume	Corresponding Injection volume (µL)
5 µL Syringe	1	2	0.1
	2	10	0.5
	3	20	1.0
	4	30	1.5
	5	40	2.0
	6	50	2.5
10 µL Syringe	1	2	0.2
	2	10	1.0
	3	20	2.0
	4	30	3.0
	5	40	4.0
	6	50	5.0
25 µL Syringe	1	2	0.5
	2	10	2.5
	3	20	5.0
	4	30	7.5
	5	40	10.0
	6	50	12.5
50 µL Syringe	1	2	1.0
	2	10	5.0
	3	20	10.0
	4	30	15.0
	5	40	20.0
	6	50	25.0
100 µL Syringe	1	2	2.0
	2	10	10.0
	3	20	20.0
	4	30	30.0
	5	40	40.0
	6	50	50.0

7693 autosampler model (G4513 turret)

	Value entered in the Injection Volume field of the acquisition method (µL)
5 µL Syringe	0 - 2.5
10 µL Syringe	0 - 5
25 µL Syringe	0 - 12.5
50 µL Syringe	0 - 25
100 µL Syringe	0 - 50
250 µL Syringe	0 - 125
500 µL Syringe	0 - 250

GC error codes

The following list translates the main error codes that can be returned by the 7890:

Error -1	unknown error";
Error 2	unspecified error";
Error 5	requested operation is not implemented on this port";
Error 6	string passed in the content of a request is too long";
Error 7	server (GC) has run out of memory";
Error 8	attribute or element value has the wrong format";
Error 9	buffer used to format a message is too small";
Error 10	value of an attribute or element is not in the valid range";
Error 11	server (GC) has too many subscribers to a given data/status/event";
Error 12	output message can't be sent";
Error 13	invalid pointer was passed to a function";
Error 14	required license key is not given";
Error 15	license key is not valid";
Error 16	license key does not grant sufficient rights";
Error 17	license key has expired";
Error 18	too many elements given";
Error 19	input message is too large for parser";
Error 20	an unsupported construct was used in a message";
Error 21	an element or attribute was duplicated";
Error 22	a string is not of the expected length";
Error 23	a string is too short";
Error 24	operation is not valid for this port";
Error 25	error parsing target url";
Error 26	internal error creating socket";
Error 27	target did not respond";
Error 28	target refused connection";
Error 29	GC refused to do an injection";
Error 30	GC refused to do a blank run";
Error 31	SubScribeToData:
Error 32	SubScribeToData:
Error 33	SubScribeToData:
Error 34	EEPROM device did not respond";
Error 35	EEPROM record address error";
Error 36	EEPROM device address out of range 0-9";
Error 37	EEPROM device did not respond correctly";
Error 38	Checksum error in EEPROM record";
Error 39	Client is not GC owner as required to perform command";
Error 40	SubscribeToData:
Error 41	ReadBarcode:
Error 42	The operation is not allowed at this time, or with the GC in its current state";

Autosampler error codes

The following list translates the main error codes that can be returned by the autosampler:

Error 100	Tray Z axis failed to find home.
Error 101	Tray Radius failed to find home.
Error 102	Tray Theta failed to find home.
Error 103	There was a bottle in the gripper.
Error 104	There was no bottle in the gripper.
Error 105	A stop key was pressed.
Error 106	The selected injector is not present.
Error 107	The tray is not present.
Error 108	Bar code reader is not present.
Error 110	Autoinjector communications error.
Error 111	Autoinjector front turret syringe error.
Error 112	Autoinjector front turret turret error.
Error 113	Autoinjector front turret plunger error.
Error 114	Autoinjector front turret incomplete injection.
Error 116	Autoinjector front door was open.
Error 117	Autoinjector front turret was reset.
Error 120	Autoinjector communications error.
Error 121	Autoinjector back turret syringe error.
Error 122	Autoinjector back turret turret error.
Error 123	Autoinjector back turret plunger error.
Error 124	Autoinjector back turret incomplete injection.
Error 126	Autoinjector back door was open.
Error 127	Autoinjector back turret was reset.